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Benefits, Costs, and Risks: Oversight of Health and Environmental Decisionmaking

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BENEFITS, COSTS, AND RISKS: OVERSIGHT OF HEALTH AND ENVIRONMENTAL DECISIONMAKING

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Recent years have brought increased reaction to the successes of the environmental movement. The pervasiveness of environmental regulation has prompted inflation-conscious skeptics in the White House and on Capitol Hill to rally around the cries of industry that environmental and health protection costs too much.[1] Under the banner of regulatory reform, these critics have sought to make regulations more "efficient."[2] They insist that the costs imposed by environmental and health regulations be justified by their benefits. The panacea they offer, in one form or another, is cost-benefit analysis.[3]

The ethic of efficiency has been espoused by members of every branch of government. President Carter has ordered that all agencies take steps to minimize the economic burdens that their regulations impose upon the private sector.[4] Enforcing this mandate, the Regulatory Analysis Review Group has insisted that major regulatory proposals be subjected to rigorous and complete analysis of all costs and benefits.[5] Congress, too, has been contemplating a variety of attempts at regulatory reform. Dozens of bills have been submitted, proposing legislative vetoes, stricter judicial review, "sunset" provisions, and other measures.[6] The leading measures urging comprehensive reform require also some analysis of the costs and benefits of major regulatory programs and proposals.[7] Even the

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1. 14 WEEKLY COMP. OF PRES. DOC. 557 (Mar. 23, 1978). *See* Light, *No Floor Action Seen on Regulatory Reform Until Next Year,* 37 CONG. Q. WEEKLY REP. 2543 (1979).

2. *See* 14 WEEKLY COMP. OF PRES. DOC. 557 (Mar. 23, 1978).

3. *See* Exec. Order No. 12,044, 3 C.F.R. 152 (1979).

4. Statement on Executive Order 12044, Improving Government Regulations, 14 WEEKLY COMP. OF PRES. DOC. 562 (Mar. 23, 1978).

5. *See* Tolchin, *Presidential Power and the Politics of RARG,* REGULATION 44 (July/Aug. 1979).

6. *See* Light, *supra* note 1. *See also* Comment, *Reconditioning the Administrative Process: Congress Weighs "Regulatory Reform" Legislation,* 9 ENVT'L L. REP. (ELI) 10,100 (1979).

7. S. 262, 96th Cong., 1st Sess., 125 CONG. REC. S861-69 (daily ed. Jan. 31, 1979); S. 755, 96th Cong., 1st Sess., 125 CONG. REC. S3338-45 (daily ed. Mar. 26, 1979); S. 1291, 96th Cong., 1st Sess., 125 CONG. REC. S7128-34 (daily ed. June 5, 1979); S. 2147, 96th Cong., 1st Sess., 125 CONG. REC. S19040-52 (daily ed. Dec. 18, 1979).

courts have championed the cost-benefit ethic. The Fifth Circuit declared recently that before the Occupational Safety and Health Administration can promulgate any standard to protect workers' health, it must demonstrate that the benefits expected bear a reasonable relationship to the costs.[8]

The cost-benefit fervor is not universally contagious. Critics condemn the cost-benefit movement as a charade, and an attempt not to make regulation efficient, but rather to defeat it altogether.[9] Experts caution that the limits and distortion of the methodology are ignored systematically by cost-benefit advocates.[10] And Congress continues to prohibit application of cost-benefit principles in some areas. To mention but one example, the Delaney Clause,[11] prohibiting the use of carcinogenic chemicals in foods, is defended strongly in Congress,[12] despite confident assertions that benefits of the practice greatly outweigh the risks.[13]

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8. American Petroleum Inst. v. OSHA, 581 F.2d 493 (5th Cir. 1978), *cert. granted*, 440 U.S. 906 (1979) (Nos. 78-911, 78-1036) (argued Oct. 10, 1979, 48 U.S.L.W. 3256). The Fifth Circuit relied on the "reasonably necessary" language of the Occupational Safety and Health Act (OSHA). An "occupational safety and health standard" is defined as "a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment." (29 U.S.C. § 652(8) (1976)). 581 F. 2d at 503, *following* Aqua Slide 'N' Dive Corp. v. Consumer Product Safety Comm'n, 569 F.2d 831 (5th Cir. 1978) (interpreting comparable language in the Consumer Product Safety Act).

This substantive conclusion was buttressed by finding in OSHA a procedural obligation to estimate benefits as well as costs, in order to assess the reasonableness of their relationships. OSHA's failure to estimate the benefits in addition to costs deprived the rule of evidentiary support necessary to sustain it before a reviewing court. 581 F.2d at 503-04. The benzene decision is understood as being a harbinger for wider endorsement of cost-benefit methodologies in health and safety decisionmaking. *See* Tolchin, *supra* note 5, at 44. The D.C. Circuit recently characterized the Fifth Circuit's benzene decision as "especially unpersuasive." AFL-CIO v. Marshall, No. 78-1562, slip op. at 57 n.169 (D.C. Cir., Oct. 24, 1979, as amended Nov. 14, 1979).

9. HOUSE SUBCOMM. ON OVERSIGHT AND INVESTIGATIONS, INTERSTATE AND FOREIGN COMMERCE COMMITTEE, 94TH CONG., 2D SESS., FEDERAL REGULATION AND REGULATION REFORM 555 (Subcomm. Print 1976); Zimmerman, *Risk-Benefit Analysis: The Cop-Out of Government Regulation*, 14 TRIAL MAGAZINE 44, 47 (Feb. 1978). *See also* M. GREEN & N. WAITZMAN, BUSINESS WAR ON THE LAW: AN ANALYSIS OF THE BENEFITS OF FEDERAL HEALTH/SAFETY ENFORCEMENT (1979) (The Corporate Accountability Research Group).

10. Even the Administrative Conference offers precautionary advice about agency use of cost-benefit analyses (mostly calling for clarification of methodologies undertaken) consistent with a report critical of current practices prepared for the Conference's Committee on Agency Decisional Process. Draft Recommendation on Use of Cost-Benefit and Other Similar Analytical Methods of Regulations, 44 Fed. Reg. 12,198 (1979). *See also* M. Baram, Regulation of Health, Safety and Environmental Quality and the Use of Cost-Benefit Analysis, Final Report to the Administrative Conference of the United States (Mar. 1, 1979).

11. Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 348(c)(3)(A) (1976).

12. *See* REPORT ON SACCHARIN EXTENSION, TOGETHER WITH ADDITIONAL AND DISSENTING VIEWS, H.R. REP. NO. 348, 96th Cong., 1st Sess. (1979).

13. Martin, *The Delaney Clause and Zero Risk Tolerance*, 34 FOOD, DRUG, & COSM. L. J. 43 (1979); See Hutt, *Public Policy Issues in Regulating Carcinogens in Food*, 33 FOOD, DRUG, & COSM. L.J. 541, 556 (1978) ("the essential element in future food safety policy consists of a risk analysis, rather than a benefit analysis") ("the concept of 'benefit' remains a wholly subjective determination that defies logic or even objective analysis").

This article considers problems of "regulatory reform" in the context of environmental and health decisionmaking. Specifically, in part I, this article defines cost-benefit analysis, explores its advantages and limitations, and assays cost-benefit practice in light of descriptive theoretical and practical demands of formal decisionmaking[14] within administrative agencies. The two remaining sections of this article focus on the question of how Congress and the courts can, do, and should structure environmental and health regulation. In part II, the article explores legislative models for agency consideration of costs and benefits in promulgating regulations. It examines four alternative models, and identifies normative considerations influencing the choice of formulation.

Structuring agency consideration of costs in promulgating regulations, however, is but a partial solution. Under any model of cost-consideration, critical policy issues remain—the resolution of uncertainty and the protection of agencies' predictive judgments. Decisions of whether to regulate, and to what degree, often depend as much upon what to do when facts are unavailable as upon assessment of statutory criteria. Therefore, part III looks at standards of judicial review, and the assignment of burdens of production and proof as techniques of addressing uncertainty.

I. Cost-Benefit Analysis—Its Origins and Functions

A. The Theory and Its Limitations

Cost-benefit analysis is a methodology for determining which government actions, projects, or regulations are worth the investments and sacrifices they require.[15] Its philosophical roots are the utilitarianism of Jeremy Bentham.[16] Recognizing that government decisions often require a reconciliation of incommensurable interests, cost-benefit analysis seeks to reduce all concerns to a common denominator—the dollar. It then compares the costs and benefits, in dollar terms, of competing government options. Cost-benefit analysis thus emulates the investment decision of the private firm.

The theoretical limits of cost-benefit analysis have been well-assayed in the literature.[17] A fundamental limitation is that cost-benefit analysis

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14. This article's definition of formal decisionmaking includes cost-benefit analysis, and systems or decision analysis, which involves comparing alternatives, predicting consequences, and quantification. For a general introduction to terms, *see* E. Stokey and R. Zeckhauser, A Primer for Policy Analysis (1978).

15. Steiner, *The Theory of Marginal Public Expenditure Choices*, in Benefit-Cost Policy Analysis 235 (1974); *see* Prest & Turvey, *Cost-Benefit Analysis: A Survey*, 75 Econ. J. 683, 686 (1965); E. Mishan, Economics for Social Decision: Elements of Cost-Benefit Analysis 13 (1973).

16. Coddington, *"Cost Benefit" as the New Utilitarianism*, 43 Pol. Q. 320 (1971).

17. *E.g.*, O. Eckstein, Water Resource Development: The Economics of Project Evaluation Ch. II (1961); R. McKean, Efficiency of Government Through Systems Analysis: With Emphasis on Water Resources Development (1958); Wildavsky, *The Political Economy of Efficiency: Cost-Benefit Analysis, Systems Analysis, and*

measures only the economic efficiency[18] of alternative actions. It identifies which proposals offer the most pie for the money. Ordinarily, it does not consider the sizes of the slices that get passed around, or who receives them.[19]

The measurement of efficiency poses severe practical difficulties, as discussed below.[20] But the assumptions upon which this measurement depends restrict even the theoretical power of the analysis. First, cost-benefit analysis assumes that all interests can be adequately expressed in dollars. It is undisputed that the dollar is by far the most common denominator in the valuation of commodities in our society. But it is also clear that many things, indeed, many of those that we hold most dear, are not readily susceptible to valuation in those terms. For some goods, valuation may be difficult simply because there are no market transactions from which to measure or infer dollar values.[21] But for others, the prob-

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Program Budgeting in POLITICAL SCIENCE AND PUBLIC POLICY 57(A. Ranney ed. 1968); Prest & Turvey, *supra* note 15. *See generally* Williams, *Benefit-Cost Analysis in Natural Resources Decisionmaking: An Economic and Legal Overview*, 11 NAT. RESOURCES LAW. 761 (1979).

18. The traditional economists' definition of efficiency is the "Pareto" criterion, which holds that a policy is efficient if it makes some people better off without hurting anyone. Kaldor and Hicks modified this test, contending that a policy is efficient if the gainers theoretically could compensate the losers. This is the criterion ordinarily employed in cost-benefit analysis. *See* Williams, *supra* note 17. This is true even though losers are not paid off.

19. An efficiency analysis is not concerned with questions of equity or the distributions of effects, so it is important to acknowledge that a decision adjudged feasible for cost-benefit purposes is "quite consistent with an economic arrangement that makes the rich richer and the poor poorer." E. MISHAN, *supra* note 15, at 13. *See* Peskin & Seskin, *Introduction and Overview*, in COST BENEFIT ANALYSIS & WATER POLLUTION POLICY 4-5 (H. Peskin & E. Seskin eds. 1975). O. ECKSTEIN, *supra* note 17, at 35-37; Krutilla, *Welfare Aspects of Benefit-Cost Analysis*, 69 J. POL. ECON. 226 (1961); S. MARGLIN, PUBLIC INVESTMENT CRITERIA: BENEFIT-COST ANALYSIS FOR PLANNED ECONOMIC GROWTH 32-34 (1967). *But see* A. DASGUPTA & D. PEARCE, COST-BENEFIT ANALYSIS: THEORY AND PRACTICE 69 (1972); G. CALABRESI & P. BOBBITT, TRAGIC CHOICES 83-92 (1978); Weisbrod, *Income Redistribution Effects and Benefit-Cost Analysis*, in PROBLEMS IN PUBLIC EXPENDITURE ANALYSIS 177 (S. Chase, Jr. ed. 1968). *See also* Gaffney, Diseconomies Inherent in Western Water Laws; A California Case Study (Economic Analysis of Multiple Use, Western Agr. Econ. Research Council Rep. No. 9, Jan. 1961).

20. *See* text at notes 30-46 *infra*.

21. *See generally* Bishop & Cicchetti, *Some Institutional and Conceptual Thoughts on the Measurement of Indirect and Intangible Benefits and Costs*, in COST BENEFIT ANALYSIS & WATER POLLUTION POLICY 105 (H. Peskin & E. Seskin eds. 1975); Fisher & Krutilla, *Valuing Long Run Ecological Consequences and Irreversibilities*, in COST BENEFIT ANALYSIS & WATER POLLUTION POLICY 271, 283 (H. Peskin & E. Seskin eds. 1975) (discussing "option" values). Unhappy assumptions abound in the valuation of public goods. A. KNEESE, ECONOMICS AND THE ENVIRONMENT 229-30 (1977). The birds killed in the Santa Barbara oil spill were valued at one dollar apiece. Tihansky, *A Survey of Empirical Benefit Studies*, in COST BENEFIT ANALYSIS & WATER POLLUTION POLICY 159 (H. Peskin and E. Seskin, eds. 1975) citing W. Mead & P. Sorenson, The Economic Cost of the Santa Barbara Oil Spill, in University of California, Santa Barbara Oil Symposium (Dec. 16-18, 1970). A day of recreation on the Delaware River has been valued between $.75 and $5.00. B. ACKERMAN, S. ROSE-ACKERMAN, J. SAWYER, & D. HENDERSON, THE UNCERTAIN SEARCH FOR ENVIRONMENTAL QUALITY, 103 n.4 (1974).

lem is more fundamental: dollars may simply be incapable of capturing the value which an individual or society places on them.[22] This may be true of concerns valued in moral or aesthetic terms. The extraordinary protection provided to endangered species and wilderness areas would be hard to explain in terms of dollars and cents. And when a human life is at stake, moral factors[23] clearly dominate decisionmaking.[24]

The second assumption upon which the measurement of efficiency depends is that the value of any commodity to an individual is accurately reflected by his willingness to pay for it.[25] This assumption is, of course, essential to the reduction of all values to dollar terms. But it relies on the value judgment that decisions should be made on the basis of one dollar, one vote. Each individual's preferences are weighted by the number of dollars he is able to put behind them.[26]

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22. *See* text at notes 39-43 *infra*. W. ROWE, THE ANATOMY OF A RISK 146 (1977), quoting Lederberg, *Squaring an Infinite Circle*, 27 BULL. ATOM. SCI. 43, 44 (Sept. 1971):

> By any rational argument, the health of any individual is a priceless good. This does not set its value at mathematical infinity, so much as to point out that it is incommensurable with so-called strictly pecuniary evaluation . . . . Pecuniary estimates are hardly to be taken seriously except to suggest the scale of a cost benefit analysis. Many citizens may feel that they value their health and their lives more highly than does the multitude; and they wish to maintain the voluntary option to strike different bargains in areas that exercise their particular anxieties. It is one thing to advertise the merits of a transaction; it is another to impose it willy-nilly on the whole population.

23. *See* note 26 *infra*.

24. *See generally* G. CALABRESI & P. BOBBITT, *supra* note 19, at 83-92. The presence of moral concerns in regulation protecting human health or life is illustrated by the wide disparity in the costs of risk avoidance that society now tolerates. Accept for the moment that one life will be saved for every $3 billion invested in hydrogen recombiners in nuclear power plants, for every $150 million spent on benzene control in the workplace, for every $2.5 million paid to clean up drinking water, for every $500,000 devoted to reducing the hazards of upholstered furniture, for every $80,000 spent on seat belts, and for every $30,000 invested in mobile emergency cardiac units. O'Donnell, The Need for a Cost-Benefit Perspective in Nuclear Regulatory Policy (presented at the Atomic Industrial Forum, Workshop on Reactor Licensing and Safety, New York, May 14, 1979). See Inhaber, *Risk with Energy from Conventional and Nonconventional Sources*, 203 SCI. 718 (1979); Starr, *Social Benefit versus Technological Risk*, 165 SCI. 1232 (1969). Some of this disparity is due to contrasting assessments of the fairness of certain types of risk creation. For instance, the Environmental Protection Agency's ambient standards for a variety of toxic substances average in excess of one hundred times more stringent than OSHA's in-plant standards for the same substances. W. ROWE, *supra* note 22, at 306. The commonly accepted rationale is that the "voluntary" exposure of the worker justifies the lesser protection, *id.* at 306-07, although EPA must be concerned also with different and more vulnerable populations at risk. Regardless of the merits of this rationale, it is clear that more than efficiency is being considered in the setting of minimum health standards.

25. *See* Williams, *supra* note 17, at 766-770.

26. *See* Davidson, *The Valuation of Public Goods*, in ECONOMICS OF THE ENVIRONMENT: SELECTED READINGS 345, 351-52 (R. Dorfman & N. Dorfman, eds. 1972). Reliance on willingness-to-pay of course aggravates the difficulties of placing dollar values on life, since most of us are unwilling to accept a price for that which we hold most dear. This theoretical barrier is overcome by recognizing that ordinarily specific victims cannot be designated in advance, and thus the cost is only a sum to compensate for additional risks of exposure. Schelling, *The Life You Save May Be Your Own*, in PROBLEMS IN PUBLIC

Finally, cost-benefit analysis assumes that individuals' willingness-to-pay, in the aggregate,[27] can be measured or inferred from market prices. For many goods, market prices are simply unavailable, and speculation takes over. But more fundamentally, reliance on the present market to measure the values of future goods to future generations is a dubious endeavor.[28] The decisionmaker who uses today's preferences to discount tomorrow's life is one whose impartiality might reasonably be questioned.

Thus, at the theoretical level, cost-benefit analysis is an appealing methodology with important limitations. It is appealing because if offers a calculus that permits reduction of complex policy decisions to easily comprehensible terms. It is conceptually simple and objective. Yet these advantages are the source of its limitations. Arguably, it is simple because it considers only one dimension of human and social values, ignoring critical moral and aesthetic concerns. Its dedication to hard numbers and the objective measurement of values leads to a reliance on "willingness-to-pay" and market prices that bias the analysis against the poor, and against future generations.[29]

B. Practical Problems

In addition to theoretical limitations, the use of cost-benefit analysis in public decisions poses many problems in application. Cost-benefit analysis requires identification, classification, quantification, monetization, and presentation of the effects of a proposed action.[30] Each of these five stages is beset by practical difficulties. The initial task of identifying the likely effects of a proposed action is inherently difficult and the analyst must often limit arbitrarily the scope of his inquiry.[31] The danger is that

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EXPENDITURE ANALYSIS 127 (S. Chase, Jr., ed. 1966). Of course, where a known life is on the line a strict view of the theory supports the spending of whatever it takes. *Cf.* Calabresi, *Reflections on Medical Experimentation in Humans,* 98 DAEDALUS 387 (Spring 1969). During combat in wartime, the armed forces risk many lives and spend millions to rescue a single downed flyer caught behind enemy lines. *See also* note 146 *infra.*

27. The leap from individual preference to collective rationality is theoretically hazardous because we have not found a satisfactory way to facilitate comparisons by attaching cardinal numbers to human values. *See* A. DASGUPTA & D. PEARCE, *supra* note 19, ch. 3, discussing the impossibility theorem of K. ARROW, SOCIAL CHOICE AND INDIVIDUAL VALUES (2d ed. 1963). *See also Introduction,* ECONOMICS OF THE ENVIRONMENT: SELECTED READINGS xxxi (R. Dorfman & N. Dorfman eds. 1972) ("the notion that individual utilities can be compared or summed was abandoned long ago"); V. THOMPSON, DECISION THEORY, PURE AND APPLIED 4-5 (1971).

28. *See* Krier, *The Irrational National Air Quality Standards: Macro- and Micro-Mistakes,* 22 U.C.L.A. L. REV. 323, 334 n.34 (1974).

29. See Green, *The Faked Case Against Regulation,* Wash. Post, Jan. 21, 1979, § C, at 1 ("given the state of the economic art, mathematical cost-benefit analyses are about as neutral as voter literacy tests in the old South"); Lovins, *Cost-Risk-Benefit Assessments in Energy Policy,* 45 GEO. WASH. L. REV. 911 (1977); HOUSE SUBCOMM. ON OVERSIGHT AND INVESTIGATIONS, *supra* note 9, at 555.

30. *See* L. ANDERSON & R. SETTLE, BENEFIT-COST ANALYSIS: A PRACTICAL GUIDE 1-2 (1977).

31. In addition, potential effects of alternative policies must be identified, posing

the analysis may not comprehend important effects or may choose to ignore them.[32] Even the classification of effects, once identified, as costs or benefits may depend upon the analyst's perspectives and upon the valuation techniques used.[33] Despite these difficulties, identification and classification of the expected effects is a useful exercise, and arguably essential to rational decisionmaking.

Quantification and monetization of a policy's effects are less clearly valuable and neither is critical to a rational decision.[34] These procedures allow the decisionmaker to reduce competing interests to commensurable terms, thereby simplifying and elucidating the balance he must conduct. But the analysis is very expensive[35] and, for some kinds of effects, reduces the quality of information provided to the decisionmaker.

A central problem posed by quantification is that it breeds and obscures uncertainty. The requirement that all effects be measured in hard numbers often demands more than social or natural science can deliver.[36] For instance, potential errors in emissions estimates are compounded by the crude conversion of these figures into estimates of ambient concentration and compounded again in the attempt to use these estimates to predict the number of deaths or illnesses incurred.[37] Similarly, any attempt to quantify future impacts is further vulnerable to uncertainties about changes in technologies, policies, and human behavior.[38]

The translation of costs and benefits of policy impacts into dollar terms often calls for imagination, if not clear distortion. Apart from the fundamental moral and theoretical questions about placing values on lives and other intangible goods, analysts' attempts to calculate such values are often clearly misguided. One standard technique for valuing lives, for

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severe challenges of technology assessment. *See* Tribe, *Technology Assessment and the Fourth Discontinuity: The Limits of Instrumental Rationality*, 46 S. CAL. L. REV. 617 (1973).

32. *See* Howard, Matheson & North, *The Decision to Seed Hurricanes*, 176 SCI. 1191 (1972) (ignoring potentially negative impacts of large-scale injection of silver iodide particles into the atmosphere).

33. Lovins, *supra* note 29, at 918-19. For example, in navigational water project planning, the savings to shippers from the project are counted as a benefit, yet the frequently concomitant losses to other modes of transportation are not counted as a cost, 49 U.S.C. § 1656(a)(1976); O. ECKSTEIN, *supra* note 17, at 7. This problem also arises in the valuation of human lives. *See* text at note 39 *infra*.

34. Clark, *Cracking Down on the Causes of Cancer*, 10 NAT'L J. 2056, 2059 (1978); Crocker, *Cost-Benefit Analyses of Cost-Benefit Analysis*, in COST BENEFIT ANALYSIS & WATER POLLUTION POLICY 341 (H. Peskin & E. Seskin eds. 1975).

35. *See, e.g.*, COUNCIL ON ENVT'L QUALITY, ENVIRONMENTAL QUALITY—1975 (Sixth Annual Report) 26-28 (1975).

36. *See generally* Leape, *Quantitative Risk Assessment in Regulation of Environmental Carcinogens*, 4 HARV. ENVT'L L. REV. 86 (1980); S. EPSTEIN, THE POLITICS OF CANCER (1978).

37. Leape, *supra* note 36, at 96-97.

38. *E.g.*, C. CHURCHMAN, PREDICTION AND OPTIMAL DECISION: PHILOSOPHICAL ISSUES OF A SCIENCE OF VALUES ch. 6 (1961); R. LUCE & H. RAIFFA, GAMES AND DECISIONS chs. 13, 14 (1957); H. RAIFFA, DECISION ANALYSIS: INTRODUCTORY LECTURES ON CHOICES UNDER UNCERTAINTY chs. 5, 10 (1968). R. KEENEY & H. RAIFFA, DECISIONS WITH MULTIPLE OBJECTIVES: PREFERENCES AND VALUE TRADEOFFS 12-13, 20-25 (1976); W. ROWE, *supra* note 22, at 65-66.

example, would count as a cost, not a benefit, extension of the lives of the non-working poor, welfare recipients, and retirees, because they consume but do not produce.[39] And who can estimate the dollar benefits of a twenty percent reduction in diarrhea among newborn infants?[40]

The problems of monetization are compounded by the difficulty of translating future dollar benefits or costs into present dollars. The choice of formula for evaluating future dollar effects today, the discount rate, is essentially a value judgment about equity between generations.[41] No consensus exists for determining the proper discount rate and a wide range of rates have been used and proposed.[42] Despite the fact that small adjustments in the discount rate can have profound effects on the balance between costs and benefits,[43] no accepted resolution of the discount rate issue has yet emerged.

Thus, many of the most important effects of policy decisions are uncertain or intangible. Because cost-benefit analysis demands that all effects be quantified and valued in dollars, the analyst is often forced to make estimates and valuations that are arbitrary, simplistic, and distorted representations of the values at stake.[44] When effects are expressed in terms that are far abstracted from the terms in which one is used to thinking about them, they become less meaningful. Information is lost.[45]

To some extent these problems can be relieved by full explanation of the assumptions upon which the analysis depends. But the final presentation of the results of the analysis is often a weak link in the chain.[46] Frequently, the decisionmaker is not made fully aware of the limits and the biases of the methodology, and of its application to the problem before him. This failure is compounded by the fact that uncertainties and potential errors may be obscured by the seeming precision of the final numbers. Hidden value judgments and arbitrary choices lurk behind the quantified conclusions.

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39. Bishop & Cicchetti, *supra* note 21, at 112.

40. *See* Handler, *A Rebuttal: The Need for a Sufficient Scientific Base for Government Regulation*, 43 GEO. WASH. L. REV. 808 (1975).

41. *See* M. Baram, *supra* note 10, at 30-32.

42. *Id.* For example, discount rates used for planning federal water projects have ranged from 2-½% to 6-⅞%. *See* NATIONAL WATER COMMISSION, WATER POLICIES FOR THE FUTURE 383-87 (1973); 43 Fed. Reg. 50,276 (1978).

43. Small adjustment in discount rates would reduce ¾ of Corps of Engineers water projects from above parity to below parity. Fox and Herfindahl, *Attainment of Efficiency in Satisfying Demands for Water Resources*, AMER. ECON. REV., PAP. AND PROCEEDINGS, 198, 202 (1964).

44. *See generally* M. Baram, *supra* note 10, at 21-29. Estimates may often reflect the interests of the estimator. For example, predictions of the number of deaths that would be prevented by a regulation requiring passive restraining systems in automobiles ranged from 2700 (by General Motors) to 19,000 (by a proponent), HOUSE SUBCOMM. ON OVERSIGHT AND INVESTIGATIONS, *supra* note 9, at 507.

45. For example, an analysis which states that a policy will yield $3 million in benefits, may be less informative than the statement that the policy will save 6 lives. *See also* K. BOULDING, ECONOMICS AS A SCIENCE 115 (1970).

46. L. ANDERSON & R. SETTLE, *supra* note 30, at 2.

C. The Theory Received

Despite its conceptual and practical frailties, cost-benefit analysis begins to look better when compared to the obvious alternatives. Uninformed intuition undoubtedly plays a major role in administrative decisionmaking today. In particular, legislative-type judgments by the agencies are classic intuitive balancing acts. Freewheeling power to decide policy issues was granted to the agencies in the informal rulemaking provision of the 1946 Administrative Procedure Act (APA), which offers only the barest assurances that the judgment be informed by anything other than the "expertise" of the decisionmaker.[47] Indeed, informal rulemaking has become the dominant mode for resolving scientific and technical issues although the theory of the APA indicates that these questions were expected to arise in the adjudicatory context subject to formal constraints.[48]

The years since 1946 have seen enormous advances in decision theory and practice, including modelling, systems analysis, and cost-benefit analysis. Within the context of informal rulemaking, agencies developed these new techniques to clarify policy options and to elucidate key decision factors. These tools became increasingly important as agency agendas were expanded to include "polycentric" problems that cut across many interests and implicated a variety of disciplines.[49] They promised a science of rational choice in complex situations.[50]

Formal decisionmaking techniques, including cost-benefit analysis, have lent themselves well to the functional needs of agency decisionmaking. They invite modelling and a reasoned expression of future consequences. They sharpen analysis by uncovering assumptions and making explicit the factors pointing to the comparative advantages of options.[51] Even if such techniques do not succeed in selecting the "best" policy, they do serve to smoke out the "worst" policies—those which inflict more damage and achieve fewer objectives than other available options.[52]

While formal decisionmaking techniques serve the functional needs of the agencies, they are equally serviceable in the promotion of institutional needs. These techniques are greedy for facts,[53] and they justify ongoing research programs that must be funded and staffed over time. They depend upon a technical work force of planners, data processors, modelers, and laboratory technicians that enhance institutional longevity

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47. 5 U.S.C. § 553(c) (1976).

48. Scalia, *Vermont Yankee: the APA, the D.C. Circuit, and the Supreme Court*, 1978 SUP. CT. REV. 345, 375-86.

49. *See* Boyer, *Alternatives to Administrative Trial-Type Hearings for Resolving Complex Scientific, Economic, and Social Issues*, 71 MICH. L. REV. 111, 116-20 (1972), *discussing* Fuller, *The Forms and Limits of Adjudication*, 92 HARV. L. REV. 353 (1978).

50. *See* R. SCHLAIFER, ANALYSIS OF DECISIONS UNDER UNCERTAINTY (1969).

51. Tribe, *supra* note 31, at 624-625.

52. These are "dominated" alternatives in the parlance of decision theory.

53. Lindblom, *The Science of "Muddling Through,"* 19 PUB. AD. REV. 79 (1959).

and prestige. The insatiable pursuit of data also facilitates delay and the avoidance of controversy; any decision dependent upon extensive data-gathering promises to be long in incubation and short on results and controversy. There is always a reason for more facts, and anyone who says otherwise is presumptively an opponent of rational thought.[54] The pursuit of some fictional technically correct "ideal" decision also enhances agency claims of independence and turns away political second-guessing.[55]

Finally, cost-benefit analysis and comparable methodologies can serve to promote agency bias under cover of technical legitimacy. To this day, the use of cost-benefit methodologies has been associated chiefly with the federal water construction agencies,[56] and that use has been subjected to a continuous drumfire of criticism.[57]

In light of the theoretical and practical shortcomings of cost-benefit analysis, and the institutional factors influencing its application, it is not surprising that the cost-benefit practice often departs radically from cost-benefit theory. The theory makes little pretense of insight into equity or income distribution effects, but the practice recognizes that discussion of the issue is essential.[58] The theory demands a quantification of all costs and benefits, but the practice settles for a mere description where intangi-

54. Many a heady regulatory notion has been brought down by the "more study" defense. For example, see W. RODGERS, CORPORATE COUNTRY chs. 1, 3, 6, 7, 9 (1973) (discussing the issues of nonreturnable beverage containers, pollution from copper and aluminum smelters, phosphates in detergents, and jet noise).

55. *See* Bruff, *Presidential Power and Administrative Rulemaking*, 88 YALE L. J. 451 (1979).

56. The first legislative imprimatur of cost-benefit analysis appears in the Flood Control Act of 1936, which conditions water project approval upon a showing that "the benefits to whomsoever they may accrue are in excess of the estimated costs." 33 U.S.C. § 701a (1976).

57. R. N. McKean's classic work on systems analysis was published more than twenty years ago, R. MCKEAN, *supra* note 17, and it called attention to popular criticisms of water project justification. This genre of expose remains in style. *See, e.g.*, Houck, *Promises, Promises: Has Mitigation Failed?*, WATER SPECTRUM 31 (Spring 1978); AMERICAN RIVERS CONSERVATION COUNCIL (and 17 other environmental organizations), DISASTERS IN WATER DEVELOPMENT II (1977). Fed by a generous supply of agency cost-benefit *faux pas*, academic critics have denounced many analyses. *See* Tihansky, *A Survey of Empirical Benefit Studies*, in COST BENEFIT ANALYSIS & WATER POLLUTION POLICY 127, 128 (H. Peskin and E. Seskin eds. 1975) (analyzing sixty studies: "of the selected studies, less than 30 percent are theoretically valid, but even fewer seem cognizant of the applicability, let alone existence, of welfare economics."). Case studies have uncovered every conceivable sleight of hand in cost-benefit miscalculation. *Id.*, at 138-44. *See* B. ACKERMAN, S. ROSE-ACKERMAN, J. SAWYER, & D. HENDERSON, *supra* note 21, chs. 6-8; Carlin, *The Grand Canyon Controversy: Lessons for Federal Cost-Benefit Practices*, in WATER RESOURCE MANAGEMENT 459 (C. Meyers & A. Tarlock eds. 1971). Justification for some water projects includes the benefits of water pollution control by dilution, which are sharply questioned by environmentalist "beneficiaries," and the benefits of recreational use of the reservoir, which are resisted by recreationalists with other experiences in mind.

58. *See* L. ANDERSON & R. SETTLE, *supra* note 30, at 1, 2; P. SASSONE & W. SCHAFFER, COST-BENEFIT ANALYSIS: A HANDBOOK ch. 7 (1978); E. MISHAN, *supra* note 15, at 10.

bles appear.[59] The theory is relentless in the pursuit of data, but the practice recognizes that the costs of data accumulation often allow only a "partial" analysis.[60] This gap between theory and practice, and the consequent possibility of misapplications, confirm the need for increased control over agency cost-benefit practices. The issue thus becomes how Congress and the courts should delineate the role formal analysis should play in agency decisionmaking.

II. Four Legislative Models of Cost-Benefit Analysis

The calls for reform, insisting upon greater attention to the benefits and costs of government regulatory action, may be answered by Congress in a variety of ways. Strict cost-benefit analysis as discussed above is only one way of considering and describing the benefits and costs of particular policies, standards, or projects. The central policy choice facing Congress is what directives to give agencies for consideration of benefits and costs. This section describes four prominent models of legislative instructions and the normative considerations for their application.

A. The Heretical Model: Cost-Oblivious

"Minimum public health requirements," Judge Campbell has written, "are often, perhaps usually, set without consideration of other economic impact."[61] These cost-oblivious provisions are exemplified by the national ambient air standards of the Clean Air Act,[62] the fishable/swimmable criteria of the Clean Water Act,[63] and a variety of other well-known prescriptions.[64]

In adopting these provisions, Congress may rely upon a number of assumptions. Three examples are illustrative. First, Congress may perform an intuitive cost-benefit analysis, estimating that the benefits of minimum health standards outweigh the costs of attaining them.[65] Agency consideration of benefits and costs is preempted by Congress's political assessment of the balance. Second, Congress may forbid the agency from

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59. *See* P. Sassone & W. Schaffer, *supra* note 58, at ch. 5.

60. E. Mishan, *supra* note 15, at 16-17.

61. South Terminal Corp. v. EPA, 504 F.2d 646, 675 (1st Cir. 1974).

62. 42 U.S.C. § 7409(b)(1) (Supp. I 1977); *see* Jorling, *The Federal Law of Air Pollution Control* in Federal Environmental Law 1058, 1083 (E. Dolgin & T. Guilbert, eds. 1974).

63. 33 U.S.C. § 1251(a)(2) (1976). State water quality standards, which allow consideration of economics at the standard-setting stage, 33 U.S.C. § 1313(c)(2) (1976), illustrate the cost-sensitive model, discussed below in text at notes 95-120.

64. *E.g.*, the Delaney Clause, of the Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 348(c)(3)(A) (1976).

65. For a mathematical demonstration that the setting of a standard implies a cost-benefit calculation, *see* Thomas, *The Animal Farm: A Mathematical Model for the Discussion of Social Standards for Control of the Environment*, in Economics of the Environment: Selected Readings 250 (R. Dorfman & N. Dorfman eds. 1972).

considering costs (even though benefits may not outweigh costs in all cases) because the transaction costs of performing a formal analysis in each case would exceed the benefits of the resulting distinctions. This argument essentially holds that benefits generally outweigh costs, and it would be "inefficient" to study all cases in order to find the few instances where this is not so.[66]

Third, Congress may adopt minimum standards without regard for even an intuitive cost-benefit analysis, because of a moral judgment that efficiency considerations are inappropriate in some areas of regulation.[67] This decision reflects the value judgment that, at least where some health hazards are concerned, the public has a right to a minimal level of protection regardless of what a cost-benefit analysis suggests.[68] Positive income distribution effects are freely assumed from health standards, although the issue is by no means closed,[69] and distributing income in this fashion is a political goal that is widely shared.[70] Thus, Congress may choose the policy of spreading health because it values gains to the winners as more important than losses to the losers.

These policy choices, alone or in combination, may offend notions of economic efficiency by possibly requiring "overinvestment" in health and environmental quality.[71] But, at least as regards the health-protective primary ambient air standards, for example, such objections appear academic, and wrong. Air pollution is a classic case of gross market failure inflicting substantial[72] health costs on an unwilling population.

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66. Doniger, *Federal Regulation of Vinyl Chloride: A Short Course in Law and Policy of Toxic Substances Control*, 7 ECOLOGY L. Q. 497, 656 (1979).

67. The Delaney Clause of the Federal Food, Drug, and Cosmetic Act, 21 U.S.C. § 348(c)(3)(A) (1976); the Occupational Safety and Health Act of 1970, 29 U.S.C. § 651 (1976); S. REP. No. 1282, 91st Cong., 2nd Sess. 9-10, *reprinted in* [1970] U.S. CODE CONG. & AD. NEWS 5175, 5185-86.

68. The uniformity of the national ambient air quality standards is designed to ensure a rough equality between regions and people. The assumption of equality between regions is criticized on economic grounds in Zerbe, *Optimal Environmental Jurisdictions*, 4 ECOLOGY L.Q. 193, 202-04 (1974). On the issue of social equity, see B. ACKERMAN, S. ROSE-ACKERMAN, J. SAWYER, & D. HENDERSON, *supra* note 21, at ch. 9; Tribe, *Legal Frameworks for The Assessment and Control of Technology*, IX MINERVA 243 (No. 2 1971).

69. See, *e.g.*, COUNCIL ON ENVT'L QUALITY, ENVIRONMENTAL QUALITY—1978 (Ninth Annual Report), ch. 10 (1978). *Compare* B. FRIEDEN, THE ENVIRONMENTAL HUSTLE (1979).

70. Recent energy related qualifications of environmental standards invariably purport to be compatible with the protection of human health. This is true, for example, of compliance date extensions under the Clean Air Act, 42 U.S.C. § 7413(d)(5)(B) (Supp. I 1977), and of the Administration's proposals for an Energy Mobilization Board. *See* The White House, Specifications for the Establishment and Operation of an Energy Mobilization Board, July 19, 1979, at 5. Before the Congress, it is politically difficult even for trade groups to assert directly that efficiency considerations require the sacrifice of health standards.

71. Krier, *supra* note 28, at 326-27; Teller, *Air Pollution Abatement: Economic Rationality and Reality*, 96 DAEDALUS 1082 (1967); Zerbe, *supra* note 68, at 212-14.

72. *See* COUNCIL ON ENVT'L QUALITY, *supra* note 69, at 419-20 (reciting estimates of $5 to $10 billion per year). The threshold assumptions of ambient standards presuppose a significant payoff in health benefits if the prescribed levels are achieved and maintained. The case for fixed standards is less persuasive upon acceptance of a linear hypothesis that health effects vary in direct proportion to exposure at low levels. *See* Ruff, *Federal Environmental*

Significant avoidance of these costs can be expected without shutdowns of the externality-generating activities. And, in light of the controversy over the valuation of human health,[73] the assertion that controls may cost more than the value of health benefits is dubious, dependent entirely upon the judgment of the analyst.

The exclusion of consideration of cost from agency decisionmaking offers significant practical benefits for administrative implementation and subsequent review. An administrative advantage is that agencies are spared the necessity of attempting a cost-benefit analysis of the standards set, and can concentrate instead on the more particularized cost judgments involved in attaining those standards. Under the Clean Air Act, for example, implementation plan development,[74] variances,[75] and enforcement offer focused opportunities for a close and realistic examination of source costs.

In addition, the adoption of a cost-oblivious health standard frees the agency from having to make political balances and enables the agency to produce a set of scientific suppositions around which further debate may proceed. The cost-oblivious model confines agency standard-setting to consideration of scientific issues such as dose-effect relationships. Although the line between science and policy may not always be clear,[76] to the extent that the scientific issues can be isolated, the agency is more likely to attain consensus on the harms caused by pollution. This, in turn, will clarify successive policy choices and discourage perpetual relitigation of basic issues of cause and effect. Where Congress establishes a single goal for agency action, agency proceedings can be more easily and clearly structured. Formless and extended proceedings, exemplified by pesticide cancellations[77] and other regulatory endeavors, can be pruned and confined.

The presence of factors[78] other than efficiency in legislative deliberations about risk assessment strongly suggests a role for the cost-

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Regulation, in SENATE COMM. ON GOV. AFFAIRS, STUDY ON FEDERAL REGULATIONS, App. to Vol. VI: Framework for Regulation, S. DOC. NO. 14, 96th Cong., 1st Sess. 255 (1978). See also NATIONAL ACAD. OF SCIENCES & NATIONAL ACAD. OF ENGINEERING, COORDINATING COMM. ON AIR QUALITY STUDIES, REPORT ON AIR QUALITY AND AUTOMOBILE EMISSION CONTROL, 93rd Cong., 2d Sess. (Comm. Print 1974) (ambient standards and associated emission limitations not shown to be economically inefficient although estimates of benefits do not greatly exceed costs).

73. *E.g.*, Kirschten, *Can Government Place A Value on Saving a Human Life?* 1979 NAT'L J. 252; R. KEENEY & H. RAIFFA, *supra* note 38 at 25-26.

74. 42 U.S.C. § 7410 (Supp. I 1977).

75. *Id.*, §§ 7522(b)(1) and 7410(e).

76. McGarity, *Substantive and Procedural Discretion in Administrative Resolution of Science Policy Questions: Regulating Carcinogens in EPA and OSHA*, 67 GEO. L. J. 729, 733-36 (1979).

77. *Id.* at 753-54.

78. These include voluntariness, uniqueness, reciprocity, unversality, controllability, comparability to natural risks and whether the risk is new, government-sponsored or catastrophic in nature. *See generally*, W. ROWE, *supra* note 22, at ch. 8; W. LOWRANCE, OF ACCEPTABLE RISKS: SCIENCE AND THE DETERMINATION OF SAFETY, ch. 3 (1976); Fletcher, *Fairness and Utility in Tort Theory*, 85 HARV. L. REV. 537 (1972). *Compare* note 24 *supra*.

oblivious model. Particularly in the context of public health, as the apparent utility of cost-benefit analysis diminishes, the justification for decisive political intervention grows stronger. Congress should step in to assert values that escape the efficiency analysis. Cost-benefit theory and practice function poorly where the issue involves significant income redistribution effects, controversial valuation decisions on life or intangibles, or judgments on uncertainties. The theory and practice are dysfunctional where they encourage the pursuit of data that is unlikely to affect the conclusion or where they approve a delay in a decision to pursue information that is practically unobtainable. These are occasions where decisive political action is most needed.

B. The Nominal Convert: Cost-Effective

A congressional determination that the benefits of a goal are worth its costs does not mean that cost-benefit analysis has no role to play. Congress may mandate a formal analysis to determine the most efficient means for attaining that goal. The use of cost-benefit techniques in this role is the cost-effective model. With equity factors removed from agency consideration by prior policy decision, this model is a congressional directive that efficiency should determine the choice of means.[79] Under the Clean Water Act, for example, Congress has required that proposals for municipal sewage treatment plants reflect the most cost-efficient alternative.[80] The requirement of cost-effective means also may be implied in other regulatory programs.[81]

Often, the legislative choice is to leave the decision on means to the unregulated free market. This makes sense since the cost-effective means is rarely so obvious or so enduring that it can be discovered easily by the regulated entity, much less an overseeing agency.[82] It is not surprising, then, that the retention of free market flexibility in the achievement of environmental or health goals is defended in the legal and economic literature[83] as something approaching first principle.

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79. T. POISTER, PUBLIC PROGRAMS ANALYSIS: APPLIED RESEARCH METHODS 380-82 (1978).

80. 33 U.S.C. § 1292(2)(B) (1976). *See also* Zener, *The Federal Law of Water Pollution Control*, in FEDERAL ENVIRONMENTAL LAW 682, 696-702 (E. Dolgin & T. Guilbert eds. 1974) (discussing possible differences between cost-benefit balancing, cost-effectiveness analysis, and other cost tests).

81. For example, the Clean Air Act's new source performance standards, 42 U.S.C. § 7411 (Supp. I 1977), and the Clean Water Act's technology based effluent standards, 33 U.S.C. § 1311 (Supp. I 1977).

82. Rowen, *The Role of Cost-Benefit Analysis* in COST BENEFIT ANALYSIS & WATER POLLUTION POLICY 361, 368-69 (H. Peskin & E. Seskin eds. 1975).

83. *See, e.g.*, Roberts and Stewart, *Energy and the Environment*, in SETTING NATIONAL PRIORITIES: THE NEXT TEN YEARS 411, 440-51 (H. Owen & C. Schultze eds. 1976); Kneese, *Costs of Water Quality Improvement, Transfer Functions and Public Policy*, in COST BENEFIT ANALYSIS & WATER POLLUTION POLICY 175, 190-91 (H. Peskin & E. Seskin eds. 1975).

Despite this preference for the cost-effective solution of the market, Congress and its administrative agencies occasionally repudiate free enterprise's choice of the preferred means. Thus, for example, Congress favors the installation of scrubbers on new coal-fired plants[84] even though supplementary control systems, using such techniques as dispersion enhancement, are said to be less costly.[85] Similarly, the Occupational Safety and Health Administration insists upon technological noise controls within the plant,[86] even though mandatory employee earmuffs promise comparable protection at a fraction of the cost.[87]

Several concerns may motivate Congress to reject the market's definition of cost-effective. The cost-effective solutions advanced by trade groups are often impaired by the same market frailties that inspired regulation in the first place. They sanction spillover costs by saddling others with the burdens of control (*e.g.*, workers who are supposed to wear the earmuffs), and the costs of failure;[88] they thrive on a lack of information about the extent of the pollution or health easement. Most importantly, the market's cost-effective solution is often less effective. Control of stack gases by supplementary controls depends upon heroic meteorological predictions and dispersion assumptions that are implausible at best.[89] The person who is supposed to wear the earmuffs may yield to the demands of stifling heat, or may prefer to risk a long-term hearing loss to keep an ear open for the approaching steamroller that deals in short-term losses of life.

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84. 42 U.S.C. § 7411(b) (Supp. I 1977). *See* W. RODGERS, ENVIRONMENTAL LAW § 3.8 (1977). *Compare* Ayres & Doniger, *New Source Standards for Power Plants II: Consider the Law*, 3 HARV. ENVT'L L. REV. 63 (1979) *with* Badger, *New Source Standard for Power Plants I: Consider the Costs*, 3 HARV. ENVT'L L. REV. 48 (1979).

85. *See* Badger, *supra* note 84, at 54-57.

86. 29 C.F.R. § 1910.95(b)(1) (1979) (preferring "administrative and engineering controls" over "personal protective equipment"). On OSHA's preference for technological solutions, *see* American Iron & Steel Inst. v. OSHA, 577 F.2d 825, 837-838 (3d Cir. 1978). *But see* Continental Can Co. v. Marshall, 455 F. Supp. 1015 (S.D. Ill. 1978).

87. *Hearings on Oversight on the Administration of the Occupational Safety and Health Act, 1978, Before the Senate Subcomm. on Labor*, 95th Cong., 2d Sess. 315, 323-25 (1978) (statement of the Manufacturing Chemists Association); *see* Zeckhauser & Nichol, *The Occupational Safety and Health Administration—An Overview*, in SENATE COMM. ON GOV. AFFAIRS, STUDY ON FEDERAL REGULATION, App. to Vol. VI: Framework for Regulations, S. Doc. No. 14, 96th Cong., 1st Sess. 161, 203-04 (1978) (urging OSHA consideration of protective earplugs on basis of report estimating that a 85 dBA standard for hearing protection could be achieved at annual cost of $43 million, as opposed to $18.5 billion in capital costs alone if engineering controls are required).

88. Coase has a good idea in asserting that placement of the liability rule makes no difference where the parties are free to bargain for the least-cost solution to the pollution avoidance. Coase, *The Problem of Social Cost*, 3 J. LAW & ECON. 1 (1960). But the assumption of insignificant transaction costs normally does not hold. *See* J. HIRSHLIEFER, PRICE THEORY AND APPLICATIONS 449-53 (1976).

89. *Compare* Ayres, *Enforcement of Air Pollution Controls on Stationary Sources Under the Clean Air Amendments of 1970*, 4 ECOLOGY L.Q. 441, 449-60 (1975) *with* Stewart, *The Development of Administrative and Quasi-Constitutional Law in Judicial Review on Environmental Decisonmaking: Lessons From the Clean Air Act*, 62 IOWA L. REV. 713, 736-37 n.118 (1977).

The importance of an efficient choice of means is reflected in the literature of regulatory reform insisting upon the least restrictive regulatory option.[90] Only a perverse and punitive spirit calls for the hard and costly solution over the soft and economical one. The problem, of course, is that supplementary controls, earmuffs, labeling[91] and other cost-effective options may meet the regulatory goal some of the time. But the means preferred may be sufficiently unreliable and the prospects of success too problematical to justify acceptance. There is the possibility of a hidden loss of benefits that may accompany the least restrictive solution, and Congress should be alert to this possibility.

Finally, the industry quest for the cost-effective solution frequently fails to consider new technologies because of the large investments required, and the uncertain prospects of capturing the benefits. Congress, therefore, may design regulatory schemes to remove these disincentives or to encourage development of new technology.[92] This strategy, too, requires rejection of the market's cost-effective solution.

Thus, the same considerations that prompt Congress to mandate goals without consideration of costs may lead also to the repudiation of even a cost-effectiveness assessment of means.[93] Widespread income distribution effects, sensitivity to future generations, unanswerable valuation questions, or other uncertainties may encourage the Congress to dispense with an administrative inquiry into the hypothetical efficiency of means in certain cases.[94]

C. The Practicing Parishioner: Cost-Sensitive

The cost-sensitive model requires that costs be considered by the agency but stops short of mandating a formal cost-benefit analysis. The legislative directive is a broad delegation of authority to the agency to determine what is "feasible,"[95] "economically practicable,"[96] or "the best practicable."[97] The cost-sensitive approach is, along with cost-

90. *See* Breyer, *Analyzing Regulatory Failure: Mismatches, Less Restrictive Alternatives, and Reform*, 92 HARV. L. REV. 549 (1979).

91. Labeling is relied upon heavily to prevent pesticide misuse despite longstanding empirical evidence that people neither read nor heed labels. *E.g.*, DEP'T. OF HEW, REPORT OF THE SECRETARY'S COMMISSION, PESTICIDES AND THEIR RELATIONSHIP TO ENVIRONMENTAL HEALTH 149 (1969).

92. For example, the Clean Water Act offers financial incentives to municipalities to opt for innovative technology which ultimately reduces the cost of service to the consumer. 33 U.S.C. § 1285(i) (Supp. I 1977). One criterion for qualifying a design as innovative technology, in turn, is whether the life cycle costs are reduced by 15%. Innovative and Alternative Technology Guidelines, 40 C.F.R. § 35.900, app. E 6(e)(1) (1979).

93. *See* text at notes 65-70 *supra*.

94. The Clean Air Act's limited repudiation of tall stacks is illustrative, 42 U.S.C. § 7423 (Supp. I 1977), and its non-researchable assumptions suggest that a cost-benefit analysis would have little to offer.

95. *E.g.*, The Occupational Safety and Health Act, 29 U.S.C. § 655(b)(5) (1976).

96. *E.g.*, Energy Policy and Conservation Act, 42 U.S.C. § 6344(b)(2) (1976).

97. *E.g.*, Clean Water Act, 33 U.S.C. § 1281(b) (1976).

effectiveness, the dominant congressional model for the use of cost-benefit analysis; it makes costs pertinent in vague and varying ways to numerous energy, health, and environmental decisions.[98]

The cost-sensitive model enables, and often requires, the agency to consider a range of factors of congressional interest other than economic efficiency. Congress may be interested in the equitable effects of regulation on particular constituencies, such as farmers[99] or the handicapped.[100] The cost-sensitive model also permits consideration of economic factors that might escape formal cost-benefit analyses such as restricted consumer choice,[101] regional economic benefits,[102] or impacts on national energy consumption.[103] Even where Congress comes close to demanding formality in the agency decisionmaking process, it may require consideration of factors that defy treatment under even the bolder variations of cost-benefit theory.[104]

The cost-sensitive model serves legislative decisionmaking needs in a variety of ways. These statutes involve broad delegations which permit Congress to postpone hard political choices until it has a better understanding of the problem at hand. The first time around, the constituencies may not be fully mobilized, conflicts are submerged, beneficiaries and victims mere statistical abstractions, and costs and benefits are blurred contingencies. In this setting, congressional action dramatizes the problem and gives the impression of action. The agency develops experience by identifying issues and parties, collecting data, and attempting policy formations. Congress can then react to the problems in sharper focus, relying on the interim agency experience for guidance. Congress acts best as a counterpuncher, and the cost-sensitive and imprecise delegation helps it work that way.

Another consequence of the cost-sensitive format is its impact on

98. *E.g.*, 15 U.S.C. § 2002(e) (1976) (setting of fuel economy standards under the National Energy Conservation Policy Act); 42 U.S.C. § 7411 (Supp. I 1977) (establishment of new source performance standards under the Clean Air Act); 42 U.S.C. § 4916(a)(1) (1976) (establishing noise standards for railroads under the Noise Control Act).

99. Federal Environmental Pesticide Control Act of 1972, 7 U.S.C. § 136d(b) (1976). *See also* section 4(b)(1)(C), (F) of the Emergency Petroleum Allocation Act of 1973, 15 U.S.C. § 753(b)(1)(C), (F) (1976) (protecting agriculture and small refiners under regulations providing for mandatory allocation of crude oil).

100. Energy Policy and Conservation Act, 42 U.S.C. § 6263(a)(2) (1976) (gas rationing contingency plan shall include consideration of the mobility needs of the handicapped).

101. International Harvester Co. v. Ruckelshaus, 478 F.2d 615, 640-41 (D.C. Cir. 1973) (auto emission standards).

102. The Flood Control Act of 1970, 42 U.S.C. § 1962-2 (1976). Regional benefits should not be included in a cost-benefit analysis because they represent transfers of income within the economy and not benefits to the economy as a whole. *See also* the Water Resources Development Act of 1974, 42 U.S.C. § 1962d-17(c) (1976).

103. While Congress very well might be expected to ask whether the fuel economy standards will bring savings to consumers that would offset higher auto prices, it was decided to go further and require consideration also of the "need of the nation to conserve energy." 15 U.S.C. § 2002(e) (1976).

104. *E.g.*, 42 U.S.C.A. § 6295(d) (Supp. 1979).

agency development of decisionmaking techniques. The broad statutory delegations often leave open how the goals of the statute are to be attained, and agencies thus may develop novel approaches to risk assessment. Examples include EPA's Rebuttable Presumption Against Registration (RPAR),[105] used in pesticide precancellation proceedings, the Food and Drug Administration's summary judgment procedures,[106] and the Occupational Safety and Health Administration's priority system for carcinogens.[107] Cost-sensitive statutes, by encouraging experimentation with new tools of decisionmaking, have assisted in the refinement of new administrative modes of analysis[108] and procedure.[109]

Congress has many concerns on its collective mind, and directives that agency regulation be sensitive to costs facilitate consideration of goals other than pure efficiency. At the same time, however, the broad delegations characteristic of such statutes give too little guidance to the agencies, leading to charges of runaway regulation and calls for regulatory reform.[110] A greater precision in legislative charters is required, and is possible. There is considerable room for choice of a substantive standard for evaluation of costs falling somewhere between the no consideration test of the air pollution health standards[111] and the formal cost-benefit analysis.[112] The choice of standard is influenced, no doubt, by varied assumptions about how closely the regulatory regime should adhere to the free market's definition of efficiency. At one end of the spectrum is the authority to set "technologically feasible and economically practicable" industrial energy efficiency improvement targets,[113] which has been read by the Department of Energy to permit regulation only where a private firm would be inspired to act under normal investment criteria.[114] At the other end is the criterion for health

105. 40 C.F.R. § 162.6-162.11 (1979).

106. *See* Ames & McCracken, *Framing Regulatory Standards to Avoid Formal Adjudication: The FDA as a Case Study*, 64 CAL. L. REV. 14 (1976).

107. Described in Zeckhauser & Nichol, *supra* note 87, at 258.

108. *E.g.*, modelling, systems analysis, quality of life indicators, input output, net energy and risk assessment.

109. *E.g.*, expert hearing officers, conferences, rights of cross examination in hybrid rule-makings, official notice and findings, summary judgment, and referral procedures.

110. *See* Cooper, *The Role of Regulatory Agencies in Risk-Benefit Decision-making*, 33 FOOD, DRUG, & COSM. L.J. 755, 766 (1978).

111. *See* text at notes 71-73 *supra*.

112. *See* text at notes 121-126 *infra*.

113. Energy Policy and Conservation Act, 42 U.S.C. § 6344(b)(2) (1976).

114. The Secretary of Energy, in assessing technological feasibility, asks whether a particular measure "had been sufficiently accepted by the industry, if it could be implemented on a wide basis before the target date, and if it could bring significant energy savings without affecting the product produced or the processes used." II U.S. DEP'T OF ENERGY ANN. REP. 13 (1978) (DOE(GS-0033)) (Industrial Energy Efficiency Program). That the government considers regulation under such a circumstance lends credence to the view that firms do not maximize profits but rather "satisfice"—set up a standard of "good enough" and accept the first alternative that meets it. See H. SIMON, THE NEW SCIENCE OF MANAGEMENT DECISION (1977); Simon, *A Behavioral Model to Rational Choice*, 69 Q.J. ECON. 99 (1955).

standards under the Occupational Safety and Health Act ("to the extent feasible . . . no employee will suffer material impairment of health or functional capacity")[115] which has been read as requiring all controls possible to reduce an identified health risk without significant plant closure.[116] Somewhere in between are the three-tiered technology-based effluent standards of the Clean Water Act,[117] with nuances of meaning still unsettled despite years of administrative and judicial experience.

With or without legislative guidance, judicial review can give content to cost-sensitive directives. Courts generally are agreed that these statutes do not require a formal cost-benefit analysis.[118] But vague statutory criteria for consideration of costs have yielded notable differences of interpretation of identical statutory clauses.[119] Because of the dangers of broad cost-sensitive delegations, including loss of congressional control and lack of guidance to the agency, judicial review was intensified. As discussed below,[120] the judicial hard look is an understandable attempt to impose some order on the chaotic agency practices masquerading as applications of formal decision theory. As the accoutrements of "rational decisionmaking" are assembled and used, it is fully appropriate that courts closely review what the agency did, how agency techniques work, whether the data fits the model, and whether the concerns of dissenters have been addressed.

Thus, the cost-sensitive model, serving several interests, requires closer control by Congress and the courts. It gives room to the inclinations of the agencies to embrace or refine the formal methodologies. It

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115. 29 U.S.C. § 655(b)(5) (1976).

116. Industrial Union Dep't v. Hodgson, 499 F.2d 467, 478 (D.C. Cir. 1974); American Iron & Steel Inst. v. OSHA, 577 F.2d 825, 835-37 (3rd Cir. 1978); AFL-CIO v. Brennan, 530 F.2d 109, 122-23 (3rd Cir. 1975). *See also* Page, Book Review, 27 STAN. L. REV. 1345, 1349-55 (1975). The Fifth Circuit's benzene decision does not require that benefits exceed costs in a formal sense, 581 F.2d at 502-03, although the standard approved is more generous to industry than *Hodgson* by forbidding gross disparities between benefits and costs. *Id.* at 503. This reading is probably wrong but arguable; the further procedural requirement of the Fifth Circuit that OSHA develop its own data on benefits is almost certainly wrong.

117. The Clean Water Act is recognized as establishing a three-tiered arrangement from the 1977 "best practicable" standard (based on the average performance of the best existing plants) to the 1983 standard of "best available technology economically achievable" (based upon the best performer and technologies not yet applied) to the new source standard (which "should reach farther, require more in the way of extending the frontiers of technology, [and] accord less sympathy to cost consideration," W. RODGERS, *supra* note 84, at 468). The 1977 Amendments add a fourth category of best conventional pollutant control technology applicable to non-toxic pollutants. 33 U.S.C.A. § 1311(b)(2)(F) (Supp. I 1977).

118. *See* CPC Int'l Inc. v. Train, 540 F.2d 1329, 1341-42 (8th Cir. 1976); Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 387 (D.C. Cir. 1973), *cert. denied*, 417 U.S. 921 (1974).

119. *Compare* American Petroleum Inst. v. OSHA, 581 F.2d 493 (5th Cir. 1978), *cert. granted*, 440 U.S. 906 (1979) (Nos. 78-911, 78-1036) (argued Oct. 10, 1979, 48 U.S.L.W. 3256) *with* Industrial Union Dep't v. Hodgson, 499 F.2d 467, 478 (D.C. Cir. 1974). American Iron & Steel Inst. v. OSHA, 577 F.2d 825, 835-37 (3rd Cir. 1978), and AFL-CIO v. Brennan, 530 F.2d 109, 122-23 (3rd Cir. 1975). *See also* Page, *supra* note 116, at 1349-55.

120. *See* text at notes 155-165 *infra*.

permits administrative experimentation in risk assessment and procedural innovation. It allows the Congress to buy time, gain better information on costs, benefits and transfers, and use the agencies as policy lightning rods. Yet the directives from Congress lack specificity as to how costs are to enter the agency's calculus. A sharper definition by Congress of an agency's cost-consideration functions and close judicial review are two appropriate and necessary components of this model.

D. The High Priest: Strict Cost-Benefit Analysis

The model imposing upon agencies the most stringent obligations to consider costs and benefits is the requirement of a formal cost-benefit analysis. While intuition suggests that a legislative model embracing a strict cost-benefit formula might contain an enforceable substantive efficiency standard, the observable consequences are procedural in nature—requiring better definition, quantification, and a sharper description of alternatives. The most striking feature of cost-benefit analysis is that it stands out as a technical solution looking for a problem it can solve. It is impossible to discover a single example of decisionmaking being reduced to simple computation by a preordained form: if that is the classic case, it does not exist.

The origins of congressionally-required cost-benefit analyses are found in early water resource development legislation,[121] such as the Flood Control Act of 1936.[122] Historically, congressional requirements of cost-benefit analyses have been applied to government projects, not to the development of regulations. Decisions selecting and designing government projects, unlike regulatory endeavors, are strong candidates for pure efficiency analyses because they involve tasks analogous to the investments of private firms. Indeed, cost-benefit analysis originally was developed as a surrogate for private economic decisionmaking to judge the efficiency of projects private firms could not or would not undertake.[123]

Although formal cost-benefit analysis has its roots in the evaluation of projects, it is now being applied to regulations as well, however imperfectly. Some recent statutes have required a formal assessment of the costs and benefits of implementing regulations.[124] The Carter Administration, in Executive Order 12,044,[125] has demanded that all major regulations be subjected to a rigorous analysis of the burdens imposed upon

121. *E.g.*, The Rivers and Harbors Act of 1902, Pub. L. No. 57-154, § 3, 32 Stat. 372 (1902), and the Rivers and Harbors Act of 1920, Pub. L. No. 66-263, § 2, 41 Stat. 1010 (1920).

122. 33 U.S.C. § 701a (1976).

123. Prest & Turvey, *supra* note 15.

124. *E.g.*, The National Energy Conservation Policy Act, 42 U.S.C.A. § 6295(d) (Supp. 1979); *see* H.R. REP. No. 1751, 95th Cong. 2d Sess. 116, *reprinted in* [1978] U.S. CODE CONG. & AD. NEWS 8160.

125. 3 C.F.R. 152 (1978). This Executive Order requires a cost-benefit analysis of every major regulation and its alternatives. This analysis is performed by the Council on Wage and Price Stability.

the economy, and the alternatives available. This executive initiative has been the single most influential source of formal cost-benefit analysis of health and environmental regulations to date, but several bills now before the Congress contemplate sweeping proposals for formal analysis of both new and existing regulations.[126]

It is important to note, however, that mandates for formal cost-benefit analysis are rarely unqualified;[127] most require consideration of intangible or equitable factors that cannot possibly be incorporated into a pure efficiency analysis. Recent laws[128] and regulations[129] governing water resource projects, for example, have specified that the cost-benefit analysis required by the Flood Control Act of 1936[130] be supplemented by discussions of the effects of the proposed project on environmental quality, regional development, and social well-being.[131] Even Executive Order 12,044 requires only that the formal analyses be considered in the regulators' final decision.[132]

The most pervasive statutory source for cost-benefit analysis is the environmental impact statement requirement of the National Environmental Policy Act (NEPA).[133] NEPA does not require a cost-benefit analysis in specific terms, but courts have found such a requirement in the statute,[134] though they disagree on the formality required in the analysis[135] and the proper scope of review.[136] Strong arguments favor a formalized cost-benefit obligation under NEPA. A more formal analysis puts the agency under tighter restraints, so it is not surprising that both en-

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126. *See* note 7 *supra*.

127. *E.g.*, the Secretary of Energy must determine whether benefits of a proposed energy efficiency standard exceed the costs, but must also consider effects on competition and energy conservation. 42 U.S.C.A. § 6295(d) (Supp. 1979).

128. Flood Control Act of 1970, 42 U.S.C. § 1962-2 (1976).

129. Water Resources Council, Principles and Standards for Planning Water and Related Land Resources, 38 Fed. Reg. 24,778 (1973), as amended by 44 Fed. Reg. 72,978 (1979).

130. 33 U.S.C. § 701a (1976). *See* Maass, *Benefit-Cost Analysis: Its Relevance to Public Investment Decisions*, 80 Q.J. ECON. 208, 212 (1966) (statutory standard of "benefits to whomsoever they may accrue" does not specify efficiency benefits to the exclusion of equity benefits).

131. This multi-objective approach in water resource planning is discussed in Jaffe, *Benefit-Cost Analysis and Multi-Objective Evaluation of Federal Water Projects*, 4 HARV. ENVT'L L. REV. 58 (1980).

132. 3 C.F.R. 152 (1978).

133. 42 U.S.C. §§ 4321-4347 (1976).

134. The leading case is Calvert Cliffs' Coordinating Comm. v. AEC, 449 F.2d 1109 (D.C. Cir. 1971).

135. *Compare* Environmental Defense Fund v. Armstrong, 352 F. Supp. 50, 57 (N.D. Cal. 1972), *aff'd*, 487 F.2d 814 (9th Cir. 1973), *cert. denied*, 416 U.S. 974 (1974) *with* Montgomery v. Ellis, 364 F. Supp. 517, 521 (N.D. Ala. 1973). *See* Rosen, *Cost-Benefit Analysis, Judicial Review, and the National Environmental Policy Act*, 7 ENVT'L L. 363 (1977); Note, *Cost-Benefit Analysis and the National Environmental Policy Act of 1969*, 24 STAN. L. REV. 1092 (1972).

136. *Compare* Environmental Defense Fund v. Froehlke, 368 F. Supp. 231, 240-241 (W.D. Mo. 1973), *aff'd*, 497 F.2d 1340 (8th Cir. 1974) *with* Environmental Defense Fund v. Corps of Engineers, 492 F.2d 1123, 1134 (5th Cir. 1974).

vironmentalists[137] and industry[138] urge cost-benefit formality as a part of NEPA obligations. Moreover, NEPA requires that the agency discuss alternatives,[139] and cost-benefit theory points to the selection of the best one. Even recent Supreme Court decisions, narrowing the scope and content of the impact statement obligation,[140] have aided indirectly the applicability of cost-benefit principles which work best in comparing narrow-gauged, short-term options.[141] NEPA, it deserves emphasis, influences the charter of most of the agencies,[142] so any governmental agency inclined to undertake cost-benefit inquiries could be expected to invoke NEPA as supporting authority.[143]

Agency experience under NEPA points the way towards a substantive environmental protection through, perhaps, an intuitive adherence to cost-benefit theory. The theory of welfare economics, upon which cost-benefit analysis is based, embraces the restrictive Pareto criterion of efficiency as a substantive aim (approving that policy which helps some without hurting others) and at the same time confesses an inability to deal with interpersonal comparisons of utility.[144] The theoretical threat to a chosen project is thus a veto by individual opponents[145] whose extraordinarily high utility for a resource in jeopardy can force significant changes in projects or policies.[146] Government officials call this high utility opposi-

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137. *E.g.*, Sierra Club v. Morton, 510 F.2d 813, 827 (5th Cir. 1975).

138. *E.g.*, Portland Cement Ass'n v. Ruckelshaus, 486 F.2d 375, 387 (1973), *after remand*, 513 F.2d 506 (1975); *cf.* Ethyl Corp. v. EPA, 541 F.2d 1, 14-15, 29-30 (D.C. Cir. 1976).

139. 42 U.S.C. § 4332(2)(C), (E) (1976).

140. Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc., 435 U.S. 519, 551-53 (1978); Kleppe v. Sierra Club, 427 U.S. 390 (1976).

141. *See, e.g.*, Prest & Turvey, *supra* note 15, at 728-31; *cf.* Hitch, *Operations Research and National Planning—A Dissent*, 5 OPERATIONS RESEARCH 718 (Oct., 1957) ("The sort of simple explicit model which operations researchers are so proficient in using can certainly reflect most of the significant factors influencing traffic control on the George Washington Bridge, but the proportion of the relevant reality which we can represent by any such model or models in studying say, a major foreign-policy decision, appears to be almost trivial.").

142. *See* Natural Resources Defense Council v. Securities & Exchange Comm'n, 606 F.2d 1031 (D.C. Cir. 1979).

143. *See* COUNCIL ON ENVIRONMENTAL QUALITY, ENVIRONMENTAL IMPACT STATEMENTS—AN ANALYSIS OF SIX YEARS' EXPERIENCE BY SEVENTY FEDERAL AGENCIES 51 (1976) (Table 12).

144. *See* O. ECKSTEIN, *supra* note 17.

145. Wildavsky, *supra* note 17, at 55, 59. *See also* J. RAWLS, A THEORY OF JUSTICE (1971).

146. Thus, Indian fishing opportunities may be enhanced by a determined and committed minority (*see* Washington v. Washington State Commercial Passenger Fishing Vessel Ass'n, 99 S. Ct. 3055 (1979)), and whaling policies modified by single-minded demonstration (*see Paul Watson, Angry Shepherd of the Seas* Wash. Post, Aug. 24, 1979, at B1, col. 1 *re* ramming of outlaw whaling vessels). Many of the best known environmental victories are attributable chiefly to strong opposition by an individual or small group, *e.g.*, the Grand Canyon (David Brower), and DDT (Rachel Carson). *See* Sive, *Environmental Decisionmaking: Judicial and Political Review* 28 CASE W. L. REV. 827, 828 (1978). My own list would include the grizzly bear (Lewis Regenstein, Friends of Animals), stripmining legislation (Louise Dunlap, Center for Environmental Policy), Storm King Mountain (David Sive), and DDT (Charles Wurster, Environmental Defense Fund).

tion the "squawk" factor, and they respond to it.[147] The NEPA corollary of this application of cost-benefit theory is reflected in the NEPA doctrine of mitigation.

Thus, NEPA's dominant substantive standard is that of maximum mitigation, which requires best efforts to avoid damage and all possible action to mitigate it.[148] One of its important features is the linkage between project plans and mitigation,[149] reflecting some impatience with a merely potential optimum where gainers could compensate losers.[150] This judicially created mitigation or compensation function is reflected elsewhere in legislation where Congress has established formal mechanisms to pay off losers even where not constitutionally required,[151] or at least to require preparation of mitigation plans.[152]

Buying off the full measure of wrath is impossible. The appropriate level of reparations payments to nonconsenters is not easily found. The hatchery in lieu of the natural salmon run will satisfy the mild opponents, moderate the strong, and isolate the fixed. The aim is to turn down the squawk, not shut it off; mitigate, not obviate. While cost-benefit theory is vulnerable to those with a high personal utility, the practice must search for a tolerable compromise.

Cost-benefit theory thus breaks down due to its own success in determining who bears the costs. As soon as the analysis identifies winners and losers, the concerns of the losers must be addressed. The logical conclusion is that any theory, and perforce any practice purporting to produce a "best" policy for society, must address both efficiency and equity concerns. That proposition has been a sore point to cost-benefit theorists, but it has been grasped readily by many cost-benefit practitioners.[153]

Under NEPA, of course, the procedural consequences far outweigh the substantive.[154] The impact statements have become elaborate findings requirements. The obligations to consult, consider, and explain are strictly enforced. This result seems a natural response to the strict cost-benefit model. The application of capital investment theory to the intangibles and non-market values of the environment could hardly be expected

147. W. ROWE, *supra* note 22, at 63-65.

148. W. RODGERS, *supra* note 84 § 7.5, at 747-50 (1977); *see* Rosen, *supra* note 135. The Supreme Court has not been a staunch supporter of a substantive NEPA. *See* Strycker's Bay Neighborhood Council, Inc. v. Karlen, 100 S. Ct. 497 (1980) (*per curiam*).

149. *See, e.g.*, Environmental Defense Fund v. Froehlke, 473 F.2d 346 (8th Cir. 1972); Public Service Co. of New Hampshire v. Nuclear Regulatory Comm'n, 582 F.2d 77 (1st Cir. 1978), *cert. denied*, 99 S. Ct. 721 (1978).

150. Krutilla, *supra* note 19, at 227 ("To claim that welfare has increased when the *ex ante* distribution is not automatically preserved by the mechanism of intervention, requires that those who gain are able to *and do* compensate those who lose, and still have something remaining") (emphasis in original); *see also* G. CALABRESI & P. BOBBITT, *supra* note 19, at 83-92.

151. *See, e.g.*, 16 U.S.C. § 79c (1976) (Redwoods National Park).

152. *See, e.g.*, Fish & Wildlife Coordination Act, 16 U.S.C. § 662(b) (1976).

153. *See* text at notes 58-60 *supra*.

154. *See, e.g.*, Strycker's Bay Neighborhood Council, Inc. v. Karlen, 100 S. Ct. 497 (1980) (*per curiam*).

to lead ineluctably to the optimal decision. What is picked up by the agencies are the habits of formal inquiry, not the consequences of formal analysis.

In sum, the strict cost-benefit model may illuminate both the problems which confront an agency and the processes by which it resolves those problems, but it fails to command a result. The model is most useful when the principal interests at stake are primarily economic. Tradeoffs among interests that can be easily quantified are assisted by cost-benefit analysis. The formal cost-benefit model, therefore, works best in consideration of government projects, where it is closely analogous to the analysis typical of private investment decisions. The NEPA experience, however, indicates that the legislative choice of the formal model will be chiefly of procedural significance. This is emphatically true in the context of health and environmental decisionmaking.

III. Oversight of Cost-Benefit Decisionmaking

Structuring agency consideration of costs in formulating environmental policy is only part of the challenge of regulatory reform. The choice of the legislative model, including the decision to banish cost considerations entirely, must proceed with an understanding of how courts may respond to the cost-benefit exercises of the agencies. It is thus useful to inquire anew into once-settled habits of judicial review, which are being revised again in light of agency experience with the techniques of formal decisionmaking.

A. Hard Look Conventions

The disparity between the theory and practice of cost-benefit analysis reviewed in part I of this article suggests a need for judicial oversight. The theory requires a large number of value choices and assumptions. It deals unsatisfactorily with several policy challenges, including intangibles, future generations, and nonconsenting individuals. The practice embraces the theory in a number of particulars (by quantification, identification of consequences, and reduction of probabilities to present values), and departs from it in others (by addressing equity concerns and passing over intangibles). What emerges is a hodgepodge, consistent neither in theory nor practice. Different analysts, different results, is not the scientific expectation,[155] but it is the cost-benefit practice.

Confronted by these shortcomings, it is not surprising that the hard look doctrine of judicial review has flourished under a variety of cost-benefit regulatory schemes.[156] The central feature of this legal doctrine is

155. R. Ackoff, Scientific Method: Optimizing Applied Research Decisions ch. 1 (1962).

156. The hard look originally developed as a mode of judicial review of agency

a persistent demand for reasoned decisionmaking by administrative agencies.[157] The courts require an agency to identify its sources of authority and to disclose information gaps, value choices, and assumptions relied upon in the decision. Courts expect the agency to explain how its analyses were conducted and used in the decision. Occasionally, they will require an agency to complete an inquiry it has purported to undertake—by addressing soft spots highlighted by the objections of losers, by producing an explanation where one is called for, or by gathering data on a central issue.[158]

This close scrutiny review has permitted limited judicial policing of agency cost-benefit practice, most notably in the context of the National Environmental Policy Act. Courts have demanded better description of alternatives,[159] and improved explanations of methodology.[160] They have demanded disclosure[161] and even quantification of certain costs[162] and benefits.[163] They have sought reasons for questionable valuation decisions[164] or the choice of a particular discount rate.[165] But although hard look review freely asks what was done and why at all stages of the cost-benefit exercise, the intervention is circumspect, and criticisms often take the form of quarreling with departures from widely accepted decorum (inconsistency, deception, or pregnant omissions). The focus of the hard look is to understand what the agency did, as a prelude to testing that action against congressional purposes, not to reassess the judgments bound up in any cost-benefit inquiry.

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adjudicatory action, Greater Boston Television Corp. v. FCC, 444 F.2d 841 (D.C. Cir. 1970), *cert. denied*, 403 U.S. 923 (1971), but has since become the dominant mode of review for agency legislative rulemakings as well, Industrial Union Dep't v. Hodgson, 499 F.2d 467 (D.C. Cir. 1974).

157. *See, e.g.*, Rodgers, *A Hard Look at Vermont Yankee: Environmental Law Under Close Scrutiny*, 67 GEO. L.J. 699 (1979); Stewart, *Vermont Yankee and the Evolution of Administrative Procedure*, 91 HARV. L. REV. 1805 (1978). *See generally* Leventhal, *Environmental Decisionmaking and the Role of the Courts*, 122 U. PA. L. REV. 509 (1974).

158. Rodgers, *supra* note 157, at 707, citing authorities.

159. *See, e.g.*, Alaska v. Andrus, 580 F.2d 465, 472 (D.C. Cir. 1978) (alternative of delay must be considered); Joseph v. Adams, 467 F. Supp. 141 (E.D. Mich. 1979). *Compare* Rodgers, *supra* note 157, at 724-726.

160. *See, e.g.*, Montgomery v. Ellis, 364 F. Supp. 517, 521 (N.D. Ala. 1973); International Harvester v. Ruckelshaus, 478 F.2d 615 (D.C. Cir. 1973).

161. *See, e.g.*, Smeltzer v. Adams, 11 ENVIR. REP. CASES 1367, 1372 (N.D. Iowa 1978).

162. Libby Rod & Gun Club v. Poteat, 457 F. Supp. 1177 (D. Mont. 1978) *aff'd in part, rev'd in part, on other grounds*, 594 F.2d 742 (9th Cir. 1979); *see* Alaska v. Andrus, 580 F.2d 465, 476 (D.C. Cir. 1978) (reserves decision on whether it is reasonable to proceed without quantitative estimates of costs and benefits).

163. *See, e.g.*, Smeltzer v. Adams, 11 ENVIR. REP. CASES 1367 (N.D. Iowa 1978).

164. *See, e.g.*, Sierra Club v. Froehlke, 359 F. Supp. 1289, 1325-32 (S.D. Tex. 1973), *rev'd on other grounds*, 499 F.2d 982 (5th Cir. 1974); Save Our Wetlands, Inc. v. Rush, 11 ENVIR. REP. CASES 1123, 1127 (E.D. La. 1977).

165. *See* Concerned Residents of Buck Hill Falls v. Grant, 388 F. Supp. 394, 399 (M.D. Penn. 1975), *rev'd.*, 537 F.2d 29 (3rd Cir. 1976); Montgomery v. Ellis, 364 F. Supp. 517, 532 (N.D. Ala. 1973).

B. Soft Glance Departures

While the erratic practice of cost-benefit analysis has encouraged rigorous judicial review on matters of presentation and description, it is clear that courts are limited in the extent to which they may intervene to correct perceived errors in a cost-benefit analysis. When agencies employ new techniques of formal decisionmaking, address matters on the farthest reaches of human knowledge, and espouse value choices that judges have no authority to contradict, judicial review is inevitably constrained. One would expect a review that tolerates experimentation, understands gaps in information, and approves improvization while methodologies develop.

Consequently, in the midst of a great body of close scrutiny case law appear uncharacteristic examples of "kid glove"[166] review, giving administrators considerable room to make policy judgments and risk assessments without factual support where none exists. Perhaps the best known of this *genre* is the *en banc* opinion of the Court of Appeals for the District of Columbia in *Ethyl Corporation* v. *EPA*,[167] where the court sustained health-justified reductions in the lead content of gasoline additives with these observations:

> Where a statute is precautionary in nature, the evidence difficult to come by, uncertain, or conflicting because it is on the frontiers of scientific knowledge, the regulations designed to protect the public health, and the decision that of an expert administrator, we will not demand rigorous step-by-step proof of cause and effect.[168]

This deference occurs often in cases involving attacks on health[169] or environmental[170] regulations, where the agency's charter permits it to make legislative or predictive judgments necessary to protect the public against possible threats to health. Tolerant judicial review of agency policy choices, as distinguished from agency adjudicatory findings, has been exercised elsewhere, when the agency action is frankly tentative,[171] admittedly experimental,[172] or otherwise hedged by uncertainties.[173] In

166. Shell Oil Co. v. Federal Power Comm'n, 520 F.2d 1061, 1071 (5th Cir. 1975).

167. 541 F.2d 1 (D.C. Cir. 1976).

168. *Id.* at 28.

169. *E.g.*, Industrial Union Dep't v. Hodgson, 499 F.2d 467 (D.C. Cir. 1974) (asbestos dust); Society of the Plastics Industry, Inc. v. OSHA, 509 F.2d 1301 (2d Cir.), *cert. denied*, 421 U.S. 992 (1975) (vinyl chloride); American Iron & Steel Inst. v. OSHA, 577 F.2d 825 (3rd Cir. 1978), *petition for cert. pending*, Nos. 78-918 and 78-919 (coke oven emission).

170. *E.g.*, Reserve Mining Co. v. EPA, 514 F.2d 492 (8th Cir. 1975) (asbestos); *cf.* Rhodia Inc. v. Harris County, 470 S.W.2d 415 (Tex. Civ. App. 1971) (injunction for the dumping of arsenic wastes).

171. Environmental Defense Fund v. EPA, 548 F.2d 998 (D.C. Cir. 1976), *cert. denied*, 413 U.S. 925 (1977) (heptachlor and chlordane).

172. Permian Basin Area Rate Cases, 390 U.S. 747 (1968).

173. *See* Environmental Defense Fund v. Costle, 578 F.2d 337, 346 (D.C. Cir. 1978) (court "cannot wear blinders in a litigation involving an ongoing administrative process, and its ruling and relief must take account of the world as it exists as of the time of the decree").

these cases, the courts ensure the agency action is a well-reasoned effort to implement the congressional charter, but permit judgmental freedom.

A common feature of these soft glance instances of deference to the agency policy choice is that they deal with uncertainty about risks, benefits or policy directions. Uncertainty presents grave theoretical and practical challenges to any cost-benefit calculus because it forces subjective estimates of change that may undercut the objectivity of other elements of the analysis.[174] Uncertainty is also likely to precipitate conflict between the dominant legal mode of conflict resolution (which assumes an ordered sequence of events with a single definite point of termination and a static answer) and the realities of agency decisionmaking which tend towards incrementalism, experimentation, gradual redefinition of rules of behavior, and resistance to final solutions.[175] Judicial restraint in the face of administrative resolution of uncertainty is expected and proper. It is clear that rational and formal models of thought cannot replace all judgment, nor eliminate value choices. Truly creative decisionmaking, which pursues benefits with values not yet known, is ill-suited to evaluation by formal analysis.[176] The best thinking, within administrative agencies as elsewhere, requires intuition about present realities and future events.[177] Courts can hardly set in concrete what the agencies etch in clay.

There is a need also to protect the traditional power of the agencies to make policy, in short, to legislate, especially on issues of health and safety. There is an uncomfortably large range of issues which, although susceptible to being posed as questions of fact, cannot practicably be answered by science.[178] Where regulators must assess the significance of highly improbable catastrophic events or the biological effect of low-level pollutant exposures, prediction, and action based upon it, may be indispensable to the interdiction of sudden, pervasive, and irreversible damage, or the recognition of subtle and gradual damage. Evidence of risk often accumulates only incrementally and speaks in muted ways to experts who can read the signs. The points of difference between data of

174. *See* Green, *The Resolution of Uncertainty*, 12 NAT. RESOURCES J. 182, 184 (1972).

175. Bauer, *The Study of Policy Formation: An Introduction*, in THE STUDY OF POLICY FORMATION 18 (1968); *cf.* Chayes, *The Role of the Judge in Public Law Litigation*, 89 HARV. L. REV. 1281 (1976). The dispositive adjudication is unlikely as continuing improvements in knowledge repudiate assumptions about uncertainty governing earlier decisions.

176. *See* V. THOMPSON, *supra* note 27, at 5-7; Back, *Decisions Under Uncertainty: Rational, Irrational, and Non-rational*, AM. BEHAV. SCIENTIST, Feb. 1961, at 14, 16-18; Patchen, *Decision Theory in the Study of National Action: Problems and a Proposal*, 9 J. CONFLICT RESOLUTION 164 (1965).

177. *See, e.g.*, Wilder, *The Role of Intuition*, 156 SCI. 605 (1967).

178. This is true of two of the more common types of environmental and health controversies. One is the probability of extremely improbable events which cannot be determined by limited histories or involve estimates not envisaging all modes of failure. The second is the biological effect of low-level pollution exposures, since it is impossible to prove with any finite experiment that any environmental factor is "totally harmless." *See generally* Weinberg, *Science and Trans-Science*, 10 MINERVA 209 (1972).

mild concern, growing suspicion, and serious moment are judgmental, and hardly susceptible to judicial redefinition. Moreover, the resolution of uncertainty in the context of health and safety regulation proceeds without the accummulated experiences of, for example, the business world in resolving economic uncertainties. These new regulatory practices of valuing life, wilderness or reduced morbidity or choosing discount rates are intellectual adventures in areas without precedent, and thus hardly susceptible to close direction by judicial overseers.

A rule of necessity, then, counsels a judicial deference to administrative judgments that are not practicably supportable by facts. Nor, indeed, in so doing must the courts stand convicted of collusion in runaway administrative excesses, although they will be accused of this.[179] This obligatory restraint may be explained as a recognition of the inherent judicial limitations that led to the demise of substantive due process.[180] It is important to acknowledge that issues of fundamental policy, including assessments of low-level pollution and of the probability of extremely improbably events, eventually gravitate to the Congress.[181] A judicial determination refusing to look behind an administrative "policy" judgment, after all, is but a remand to the legislature for further consideration.[182]

The inevitable appearance of soft glance judicial review, in tandem with the hard look, places the agencies' cost-benefit methodologies in a new perspective. Courts can be relied upon to uncover what is done in the name of cost-benefit analysis and to encourage at least marginal improvements in presentation and description. But the courts cannot come close to imposing consensus standards of adequacy; nor can they look behind the fundamental and numerous judgments involved in identifying, classifying, quantifying, and expressing in present dollar values the effects of a policy action.[183] These limits of judicial review reaffirm the legislative obligation to recognize occasions where cost-benefit analysis functions poorly, as in matters of high uncertainty, and thus should be dispensed with in favor of the cost-sensitive model, where the parties and the agency can share the burdens of prediction, or in favor of the cost-oblivious model, where the agency is relieved altogether of the obligation of establishing benefits. These limits suggest also that other mechanisms may serve to mediate the degree of formality required in agency decisions. Prominent for these purposes is the placement and definition of the burdens of production and persuasion.

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179. *See* Cooper, *The Role of Regulatory Agencies in Risk-Benefit Decisionmaking*, 33 FOOD, DRUG, & COSM. L. J. 755, 766-69 (1978).

180. Speech by J. Skelly Wright, Judicial Review and the Equal Protection Clause, at the Harvard Law School (Oct. 1979).

181. *See, e.g., Hearings on Three Mile Island Nuclear Accident Before Senate Subcomm. on Health and Scientific Research*, 96th Cong., 1st Sess. (1979).

182. J. SAX, DEFENDING THE ENVIRONMENT (1971).

183. *See* text at notes 30-46 *supra*.

C. Burdens of Uncertainty

With the outcome often depending upon the resolution of uncertainty, it is not surprising that the assignment of the burdens of coming forward and of persuasion may control the substantive result. Congress may use burdens of proof to allocate the risks of inaction and of lack of information, and to structure judicial review of agency policymaking. When such congressional specifications are lacking, courts may invoke the doctrines of burdens of proof to implement the basic mandates of the statute.

The Administrative Procedure Act says only that in formal rulemakings, "except as otherwise provided by statute, the proponent of a rule or order has the burden of proof."[184] This burden, however, applies only to the burden of coming forward with evidence and not to the burden of persuasion,[185] and may, in any event, be subject to different statutory mandates.[186] In the absence of such an explicit mandate, the law of notice and comment rulemakings is that the burden of production is on the party with the special expertise or access to the disputed information.[187] Courts assume that in a reviewing court, the burden of showing that a rule is arbitrary or capricious is on the challenger of the rule.[188]

The Congress, then, and the courts in plumbing a subject often addressed only by implication, have a free hand in addressing the burdens of uncertainty that influence the outcome of formal decisionmaking. Both the delineation of burdens in a statute and the course of subsequent judicial review will be influenced by the substantive charter of the statute. Sharp differences, for example, appear along a spectrum of legislative choices from the demanding Delaney Clause, which bans any food additive causing cancer in test animals,[189] to imprecise statutes such as the Atomic Energy Act which approves a rather open-ended risk assessment.[190] Within these substantive limits, three models of the legislative

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184. 5 U.S.C. § 556(d) (1976).

185. Environmental Defense Fund v. EPA, 548 F.2d 998, 1013 (D.C. Cir. 1976), *cert. denied*, 431 U.S. 925 (1977) (holding that the Federal Insecticide, Fungicide and Rodenticide Act imposes the burden of establishing safety on the registrant in proceeding to suspend the registration of a pesticide).

186. *Id.*

187. 1 K. DAVIS, ADMINISTRATIVE LAW TREATISE, § 6:15, at 520 (2d ed. 1978).

188. *Id.*

189. 21 U.S.C. §§ 348(c)(3)(A), 376(b)(5)(B), 360(d)(1)(H) (1976) (food additive, color additive, and animal drugs, respectively). *Compare* Blank, *The Delaney Clause: Technical Naïveté and Scientific Advocacy in the Formulation of Public Health Policies*, 62 CALIF. L. REV. 1084 (1974) *with* Turner, *The Delaney Anticancer Clause: A Model Environmental Protection Law*, 24 VAND. L. REV. 889 (1971), *and* Comment, *Implementing the Anticancer Clauses of the Food, Drug, and Cosmetic Act*, 44 U. CHI. L. REV. 817 (1977). For a definitive analysis, *see* Merrill, *Regulating Carcinogens In Food: A Legislator's Guide to the Food Safety Provisions of the Federal Food, Drug and Cosmetic Act*, 77 MICH. L. REV. 171 (1978).

190. 42 U.S.C. § 2241 (1976); *see* 10 C.F.R. § 50.35(a) (1979). On the importance of

treatment of regulatory burdens of uncertainty appear although they represent not so much dominant categories as they do prominent points on a spectrum of possibilities.

1. Least Restrictive: Economic Regulation and the Free Market Presumption

In some cases Congress assumes that the unregulated status quo is the norm, and imposes heavy burdens of production and persuasion upon agencies advocating departures from that norm. Agencies must come forward with essential data needs, and must make a convincing case for the proposed action. The standards are set high, because the risks of inaction do not offset the potential disruptions of intervention.

Under a high burden of production, lack of information can defeat agency initiatives. Regulations or projects are conditioned upon the completion of studies not in hand or even underway. Since analyses suitable for regulatory purposes are unlikely to be undertaken by experts without a regulatory purpose, this approach anticipates a lengthy period of study before restrictions are imposed. Theoretically, the model can preclude all regulation if answers to the uncertainties are unavailable and unobtainable.[191] More likely, the fixation on resolving uncertainties is likely to make regulation difficult, time-consuming, and occasional. But, by assumption, the costs of regulation delayed are more than offset by the benefits of market dislocations avoided.

The assumption that data is obtainable takes seriously the quantification needs of formal decisionmaking. The model is thus best suited to regulatory contexts where cost-benefit analysis is useful: instances of low uncertainty, accessible market prices, and meaningful dollar valuations.[192] Decisions are assumed to be made on the basis of factual determination. This model is appropriate also to government investment decisions such as water projects where the consequence of expenditure without proof of benefits may be an unwise public investment.

In some cases under this model, Congress may establish a burden of production which requires affirmative study, as distinguished from collection and analysis of what is available, as a prerequisite to agency action. This decision to require more data is conceptually similar to the decision to require cost-benefit analysis,[193] and will be guided by similar normative considerations. Further study of efficiency details may be irrelevant when the decision is likely to turn on income distribution factors, or unverifiable guesses about values or uncertainties. More study also means more costs,

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the precision of the mandate for purposes of judicial review, *see* Rodgers, *Developments in Environmental Law and Procedures*, in PROCEEDINGS OF THE THIRTY-NINTH ANNUAL JUDICIAL CONFERENCE OF THE DISTRICT OF COLUMBIA CIRCUIT, 81 F.R.D. 310 (1978).

191. *See* Gelpe & Tarlock, *The Uses of Scientific Information in Environmental Decisionmaking*, 48 S. CAL. L. REV. 371, 392 (1974).

192. *See* text at notes 121-123 *supra*.

193. *See* text at notes 65-70 *supra*.

and in appropriate cases, these must be weighed against the benefits of information and the costs of delay.[194]

NEPA offers an example of congressional imposition of a high burden of production. The NEPA cases point to occasions where affirmative study is the reasonable predecessor of action if the data is within reach, the answers crucial, and the costs of securing the answers tolerable.[195] In light of NEPA's powerful commitment to study and documentation,[196] however, it is unlikely that a pure efficiency calculus governs the length and detail of impact statements.

Congress may also protect the status quo by imposing upon the agency the burden of persuasion. The celebrated Bumpers amendment[197] is illustrative. It would overrule the predominant current practice[198] by requiring agencies to assume the burden of supporting their rules by a preponderance of evidence in a reviewing court. But by imposing this burden on all agency actions, the Bumpers amendment would cripple many administrative initiatives. It invades the arena of permissible administrative judgment by approving a standard of judicial review that presupposes factual support where, in many cases, none may exist.[199] It discourages agencies from making policy judgments that the risks of inaction in the face of uncertainty exceed the risks of action. It erodes the manufacturers' traditional burden of proving safety by imposing an uncertain, and manipulable burden of justification on the agency. And it restricts congressional ability to delegate power to an agency to do what Congress could do itself. In short, the Bumpers amendment adopts the principles of the free market model, and applies them willy-nilly, to a broad range of issues for which they are inappropriate.

The free market model was similarly misapplied by the Fifth Circuit in the benzene case.[200] The court held that a benzene standard of 1 ppm

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194. K. BOULDING, *supra* note 45, at 65-66, H. RAIFFA, *supra* note 38; McGarity, *supra* note 76, at 736-740. *See also* Green, *supra* note 174, at 184.

In the Federal Environmental Pesticide Control Act, for example, Congress explicitly provides that:

> The Administrator, in establishing standards for data requirements for the registration of pesticides with respect to minor uses, shall make such standards commensurate with the anticipated extent of use, pattern of use, and the level and degree of potential national volume of use, extent of distribution, and the impact of the cost of meeting the requirements on the incentives for any potential registrant to undertake the development of the required data.

7 U.S.C. § 136a(c)(2)(A) (Supp. II 1978).

195. *See* note 158 *supra*.

196. *See* 42 U.S.C.A. § 4332(2)(A), (B), (C), (E) (1976).

197. S. 111, 96th Cong., 1st Sess. (1979), approved by the Senate as an amendment to the Federal Courts Improvement Act of 1971, 125 CONG. REC. S12,131-67, S12,171-72 (daily ed. Sept. 7, 1979).

198. *See* text at notes 155-165 *supra*.

199. *See* text at notes 168-177 *supra*.

200. American Petroleum Inst. v. OSHA, 581 F.2d 493 (5th Cir. 1978), *cert. granted*, 440 U.S. 906 (1979) (Nos. 78-911, 78-1036) (argued Oct. 10, 1979, 48 U.S.L.W. 3256).

could not be supported by substantial evidence in the absence of a factual showing that benefits bore a reasonable relationship to costs. Answering this question would require low level epidemiological exposure studies (which did not exist, would take years to complete, and in all likelihood would be inconclusive); construction of a valid dose-response curve for high concentration human exposure studies permitting projection of cancer risks at lower exposure levels (which is beyond the state of present knowledge); or additional animal studies (which had been unsuccessful to date).[201] The court said, "Until such estimates [of benefits] are possible, OSHA does not have sufficient information to determine that a standard such as the one under review which it can only say might protect some worker from a leukemia risk is reasonably necessary."[202]

The decision is a misapplication of the free market model and pays the price of a poor fit. In the face of serious risks of inaction, the court imposed unrealistic data requirements and assumed the possibility of a reliable resolution of uncertainty and a workable efficiency calculus.[203] Unfortunately the context in which this model is applied is one where data is short, uncertainty high, and predictive judgment at a premium.

Thus, wholly apart from whether health and safety standards under OSHA must be justified by a formal cost-benefit analysis,[204] the Fifth Circuit in the benzene case seems clearly wrong in conditioning the ambient regulation upon the completion of studies not now possible and only remotely foreseeable. Given the uncertain state of the predictive art, the resistance of the problem to analytical solution, and the consequences of a wrong choice,[205] a better reading of the legislation is to leave room for predictive administrative ventures. This calls for a standard of proof that ordinarily can be met by evaluation of the data in hand. The state of the art model offers such a standard.

2. *State of the Art*

The state of the art model embraces the assumption that the unregulated market is the norm but deviations from this norm are plausible and expected. This model strikes a balance between the informational demands of formal decisionmaking, and the regulatory need to escape a paralysis of fact. It embraces a standard of proof that tolerates uncertainty, and thus seeks pragmatically the best decision for the moment. It

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201. *Id.* at 504.

202. *Id.* at 504-05.

203. Note that the court also applied hard look habits of judicial review, suitable for probing what was done, to issues of agency policy judgments which should have been given a soft glance.

204. The presence of high uncertainty suggests that Congress actually opted for the cost-sensitive model, discussed in text at notes 95-120, *supra*.

205. Ethyl Corp. v. EPA, 541 F.2d 1, 24-26 (D.C. Cir. 1976). Indeed, sometimes the last thing we want is epidemiological experimentation on the population at large. *See* S. EPSTEIN, *supra* note 36, at 59.

anticipates a decision with data already known, requiring only that agencies use the best available evidence in reaching judgments.

Under this model, the assignment of the burden of production tends to be a pragmatic matter, with the party possessing information being the one expected to produce it. There is some authority, for example, for the proposition that agencies must produce pertinent data on environmental issues without regard to the advocacy initiatives of the parties.[206] Once the agency has established doubts about the safety of a practice (*i.e.*, a prima facie showing of market failure), the formal burden of persuasion ordinarily is shifted to the perpetrator of the risk, on the assumption that high spillover costs are unacceptable.

The state of the art burden model is the preferred model of choice for health and safety regulatory judgments. It works well in conjunction with the cost-sensitive legislative model discussed in part II. It avoids both a paralysis of indecision and unsubstantiated guesswork by permitting action on the basis of present knowledge but with consideration of incompatible data. It accommodates the policy needs of both the hard look and soft glance.

This model of assignment of burdens of production and persuasion is illustrated by a series of cases challenging health regulations promulgated under the Occupational Safety and Health Act.[207] In each case, the agency had formulated standards on the basis of its assessment of the data available. The courts upheld the predictive judgments of the agency since the industry failed to persuade the court that the standards were infeasible. In the asbestos case, for example, the agency was free under its charter to make a judgment about the degree of protection required, leaving to the industry the burden of persuasion on the issue of infeasibility.[208] This is the analysis which should have been followed in the benzene case.

A difficult issue under the state of the art model is to reconcile industry's burden of persuasion of proving safety, entitlement to exemption, or the like, with the government's obligation to justify regulatory action, which has become an integral feature of hard look judicial review. In the well-known *International Harvester* case,[209] industry had the burden of persuading the court that effective control technology was unavailable to earn a suspension of the auto emission standards. At the same time, the hard look doctrine imposed upon the Environmental Protection Agency the obligation to come forward with "a reasoned presentation of the reliability of a prediction and methodology that is relied upon to overcome a conclusion, of lack of available technology, supported prima

206. *See* Rodgers, *supra* note 157, at 718-24.

207. *See* note 169 *supra*. These cases also focused on the legislative charter to OSHA, which was interpreted to permit predictive judgments.

208. Industrial Union Dep't v. Hodgson, 499 F.2d 467, 475 (D.C. Cir. 1974).

209. International Harvester Co. v. Ruckelshaus, 478 F.2d 615, 642-43 (D.C. Cir. 1973).

faciely by the only actual and observed data available, the manufacturers' testing."[210] Because the Administrator failed to make such a presentation, under hard look review a remand was required.

International Harvester walks a fine line in encouraging formal decisionmaking that works. The danger is that the hard look doctrine's requirement of reasoned justification of agency methodologies may tend to shift the burden of proof to the agencies, thus obliterating the legislative choice in placing the burden of persuasion of safety or entitlement to exemption upon the regulated entity. In the first place, it encourages a relaxation of the standard of proof, and suggests only a reasonable production on the matter at issue. But the standard may demand more, and exact the penalty of defeat for nonproduction, and a turning of the head from the problem at hand. Second is the problem of deciding where the close justification of methodology leaves off and the discretion to make policy judgment on matters of uncertainty begins. This is the fine line between the hard look and the soft glance, and it turns chiefly on the difference between requiring explanation and accepting judgment.

3. *Most Restrictive: Regulation of Dangerous Substances and the Market Failure Presumption*

This model rejects the norm of the unregulated marketplace, and presupposes that intervention is the rule, typically on the rationale of market inability to control high spillover costs. It is a model suspicious of the workings of free market innovations, and is ready to sacrifice potential technological improvements to head off potentially damaging initiatives.

This model is the converse of the free market model in that it also takes seriously the data needs of formal decisionmaking, except that the burden of overcoming uncertainties rests upon the proponent of the proposed activity. The standard is set high because the possible severe health consequences of approval, presumptively at least, are not offset by disruption of current economic interests. The party who proposes to introduce a new technology into the market must establish the safety of the initiative under a high standard of proof. The paradigms of the model are provisions of the drug and pesticide laws,[211] which require proponents

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210. *Id.* at 648.

211. 7 U.S.C. § 136a(c)(5) (Supp. II 1978) (pesticide registration); 21 U.S.C. § 348(c)(3), (4) (1976) (food additive petition); *see* Hirich and Staelin, *Regulation of the U.S. Food Industry*, in SENATE COMM. ON GOVERNMENTAL AFFAIRS, STUDY ON FEDERAL REGULATION, APP. TO VOL. VI: FRAMEWORK FOR REGULATION, S. DOC. NO. 14, 96th Cong., 1st Sess. 397 (1978); Merrill, *Risk-Benefit Decisionmaking by the Food and Drug Administration*, 45 GEO. WASH. L. REV. 994 (1977); Note, *Pesticide Regulation: Risk Assessment and Burden of Proof*, 45 GEO. WASH. L. REV. 1066, 1078-81 (1977). *See also* TOXIC SUBSTANCES STRATEGY COMMITTEE, REPORT TO THE PRESIDENT chs. VI, VII (Aug. 1979) (draft).

Section 355(d) of the Food, Drug and Cosmetics Act provides that the Secretary can refuse to approve any new drug if industry fails to submit adequate tests of safety or substantial evidence of effectiveness. 21 U.S.C. § 355(d) (1976). Similarly, the Federal

to develop extensive data to establish the safety of a product before it will be allowed on the market. The model was proposed, but eventually abandoned, during the vigorous debate that attended enactment of the Toxic Substances Control Act of 1976.[212]

Under this model, as with the free market model, lack of data is a reason for nonapproval, and the charge is often heard that good ideas die prematurely as sacrifices to the demands of red tape.[213] Proof is hard to come by because there is limited commercial experience to draw on. Government decisionmakers are bolder because they confront no larger constituency of users in opposition, and consequently few objections in the event of a denial.

The market failure model should be reserved for instances where health or environmental spillover costs dominate the picture or where the innovation is dictated by government policies independently of market forces. The market failure model may be used in conjunction with, or as a variation of, the cost-oblivious statutes where the proponent of the activity must overcome a congressional presumption that the costs of the activity outweigh its benefits. But its data production requirements may also be used in conjunction with a cost-sensitive statutory charter.[214]

Thus, placement and definition of the burden of proof, like the basic decision on the utility of cost-benefit analysis, is a legislative choice of no small moment. In a world of uncertainty, the burdens of proof and persuasion reign supreme. The question, to be sure, is susceptible to restatement in the comprehensive dicta of formal decisionmaking—the benefits of increased public protection must be weighed against the costs of collecting information and discouraging innovation.[215] But posing a formal question does not assure a formal answer. Congress must make delicate legislative judgments about how much and what kind of information is needed to regulate on a subject, who must produce it, and where the line is drawn on the agency's duty of explanation and its responsibility for choice.

Environmental Pesticide Control Act authorizes the Administrator of EPA to determine what information will be required "to support the registration of a pesticide." 7 U.S.C. § 136a(c)(2)(A) (Supp. II 1978).

212. 15 U.S.C. §§ 2601-2629 (1976). The ensuing compromise of premarket notification is described in Office of Toxic Substances, EPA, *A Summary of the Toxic Substances Control Act*, in ASS'N OF TRIAL LAWYERS OF AMERICA, TOXIC TORTS; TORT ACTIONS FOR CANCER AND LUNG DISEASE DUE TO ENVIRONMENTAL POLLUTION 330, 333-35 (1977).

213. *See* S. PELTZMAN, REGULATION OF PHARMACEUTICAL INNOVATION: THE 1962 AMENDMENTS (1974); Hardin, *The Effects of Over-Regulation*, 34 FOOD, DRUG, & COSM. L.J. 50 (1979).

214. *See, e.g.*, the Federal Environmental Pesticide Control Act, 7 U.S.C. §§ 136-136y (Supp. II 1978). This statute imposes a heavy burden of production on those seeking to register a pesticide. *See* note 211 *supra*. And the courts have recognized that "[t]he burden of establishing the safety of a product requisite with the labelling requirements remains at all times on the applicant." Environmental Defense Fund v. EPA, 465 F.2d 528, 532 (D.C. Cir. 1972). Yet the statute employs a scheme which is strongly cost-sensitive. *See* 7 U.S.C. §§ 136(bb), 136a(c)(5)(A-D) (Supp. II 1978).

215. *See* H. Raiffa, *supra* note 38.

IV. Conclusion

Contemporary enthusiasts of cost-benefit analysis reach for a goal as noble as rational thought in a complex world. But the theory arrogantly and doggedly offers a "best" solution, in terms of a limited efficiency criterion, and comes up short. It is a theory that does not work well for decisions of high uncertainty, troubling intangibles, and extensive income transfers. Often, it is a theory that should be repudiated, or supplemented, in legislative instructions to the agencies defining the rules of decision and burdens of proof.

But the chief limits of cost-benefit analysis come not from a theory that fails to tell people how to think, or how to choose the "best" among competing values. They come from a practice that lacks common goals, standards, and credibility. There is no such thing as a common species of cost-benefit analysis and it would be well to recognize that the practice serves different roles in decisionmaking and connotes varying degrees of formality. It presumes analytical superiority and seeks to escape a record of several decades of carnival hucksterism. It encourages quantification and the use of mathematics, but pays heavily in the loss of information. It serves the worst, along with the best, of bureaucratic goals.

Thus, more skepticism is due the conventional justification for cost-benefit undertakings—that there is value in the process apart from results. What is needed is improvement in method and a move towards consensus on standards of practice. Analysts should strive to make clear what was done and why, the value judgments that permeate the analysis, and the sensitivity of the conclusions to them.

But above all, an appreciation of the limits of formal analysis must inform legislative structuring of agency decisionmaking, and allocation of the burdens of proof. In health and environmental regulation, judgments about fundamental moral and policy questions govern decisionmaking. Congress, therefore, must address these issues in its charters to the regulators through careful definition of the role of cost-benefit analysis in their decisions, and through appropriate assignment of the burdens of production and persuasion. These mechanisms are essential tools to legislative and judicial control over agency decisionmaking in these difficult but vital areas.